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The Characteristics of Lodes.

[From the Report of the U. S. Commissioner of Mining Statistics].

LODES constitute the first subdivision of inclosed deposits. A lode is a fissure in the earth's crust filled with mineral. The terms vein, lead, ledge, and reef, are used indifferently for the same thing; but all these terms are frequently applied vaguely or incorrectly to sheet-deposits which are not lodes. Thus we hear of veins of coal, and in the common usage of miners everything is a ledge which has been located. The distinction between lodes and beds is, however, really the sharpest and most positive in the whole classification. All lodes are fissure lodes, even those running parallel with the stratification of the enclosing rocks, or occurring along the contact of two different rock formations. The definition which I have given includes these cases, as I shall show more clearly in considering the radical distinction between lodes and beds. The latter are generally (but not always exactly) parallel with the inclosing rocks, and amount to nothing more, in most cases, than layers of the regular formation, differing in their contents, more or less, from the earlier layers under them and the later layers over them. In some instances the parallelism is only general. The beds widen and thin out, and on that account are sometimes held to be lodes, especially if steeply tilted. But this irregularity is common enough in all stratified rocks. The test-question deciding between a lode and a bed turns on the definition already given. A bed never is, and a lode always is, a deposit effected between already existing rocks, and therefore of later origin than the strata on either side; in other words, a fissure filled. The fissure may be across the stratification or parallel with it, or along the contact-plane of two formations; it may have been filled in any one of many ways. These all give rise to different varieties of veins; but the general definition includes all, and is as clear as it is broad. We have then, at the outset, the following conclusions from our definition:

1. The form and direction of a vein are determined by the fissure.

2. The mineral contents are determined by the time, manner, and material of the filling of the fissure.

3. The vein-material is always later than that of the formation of the "country" or inclosing rocks.

4. Sheet-deposits, intersecting a formation across the stratification, and independently of it, are certainly lodes; but all lodes need not necessarily take that direction.

5. Lodes parallel with the stratification are not so easily recognized; because they may be confounded with beds; but when they are proved to consist of material later in origin than the rocks on either side, and deposited in a seam or opening between them, whatever be its direction or dimensions, they must be considered lodes; and the same is true of "contact" lodes.

6. There are, however, contact beds, namely, layers between two formations, differing from both, but formed in the regular series of time as well as position, to which both belong. These are not lodes.

The advantage of definitions is shown in the practical conclusions which may be drawn from the foregoing simple statements, and which I insert here, to show that they are independent of the complicated hypotheses which surround this subject. No matter what theories are entertained as to how a fissure is formed, or how filled, I think the following conclusions cannot be escaped:

The history of a lode comprises logically three epochs: the forming of the fissure, determining its form; the filling of the fissure, determining its substance; and the epoch of modification, affecting both. In fact, however, two or more of these processes may go on at the same time. Logically, the fissure must be formed first; but in cases of volcanic dikes, the filling is practically simultaneous with the fissuring, and impelled by the same force. Again, changes in the form and substance of a lode do doubtless take place during, as well as after, its formation. The third epoch is added, however, to represent the realm in which modifying agencies rule supreme.

I waive at present the question how fissures are formed. It is certain that in most cases they are not immediately filled; and it is highly probable that the process of filling occupies considerable periods of time, during which the fissure remains open. Now the natural tendency of an empty fissure, unless it be perfectly vertical, is to close again, by reason of the unsupported weight of the upper side, fitly called, in miners' phrase, the "hanging wall." My observation convinces me that a great number of fissures do close in this way, and never become veins at all, but remain visible, if visible at all, only as "seams," "lines of fracture," "breaks," or "slides," having almost no filling, except clay produced by the abrasion of the rocks on either side with moisture. It is evident that for the complete formation of a lode there must be a fissure, and this fissure must be kept open till it has been filled with fresh mineral.

The same cause which tends directly to close fissures, tends indirectly to keep them open. I mean the weight of the hanging wall. Pieces of rock detach themselves from this wall and fall into the fissure, where they become wedged, and thus hold the sides apart. These pieces, when they are afterwards found imbedded in the vein matter, are called "horses." Another way by which the fissures may be kept open is by the settling back of the hanging wall, not exactly to the same place which it occupied before. In this way the surfaces of the two walls, instead of fitting each other, meet at projecting points or bulges, and leave a fissure of alternately widening and narrowing form. A simple experiment with two plates of corrugated iron will show this effect to the unprofessional reader. It must be remembered, however, that the original irregularity of fissures, and the frequently oblique or even compound motion of the wall in settling back, tend to produce departures from the simple type indicated by the above experiment. A closer analogy may be obtained by cracking open a cobble-stone, and bringing the parts together again in new positions. In this way the characteristic features of form in lodes (apart from slides and heaves, to be explained hereafter) may be produced in miniature.

The form of a fissure depends upon the original forces producing it, and its subsequent modifications, principally through the movement of its walls. We cannot lay down general laws governing all lodes in these respects; but we can discover in single lodes and groups of lodes the effects of local processes, and thus arrive at rules more or less applicable to those particular cases. That the contents of a vein have comparatively little to do with its form, is evident from the foregoing discussion. The fissure is a mould, into which the vein material is run, and the effects of that material upon its mould are comparatively insignificant. The theory,* advanced upon distinguished authority, that fissures are generally widened by the force of the crystallization of their fluid contents, is, I think, wholly without foundation. If filled with melted matter, they are more likely to shrink; if with matter in solution, the deposition of crystals is gradual, and the space is rarely so confined as to give opportunity for a force to act against the walls. The very last deposit, down the central line of the vein, might crystallize under some confinement; but it is preposterous to ascribe to it any perceptible movement of the walls. The expansive force of crystallization, as indicated in the freezing of water, is very great; but it does not come into play in the quiet deposition of crystals from solution. Nobody ever saw a geode burst open by the crystallizing of its infiltrations; yet we are asked to believe that vast weights have been moved considerable distances by such action in spaces comparatively still more insignificant. All the facts observed, moreover, such as the occurrence of "selvages," "vuggs," or empty spaces, "slickensides," etc., agree with the hypothesis of pressure from the walls, tending to close the fissure.

Fissures are limited in length, and it is impossible to tell how far they continue, except by actual exploration. Their extent in depth is equally unknown; but well-defined fissures have been thus far found to continue in depth further than human skill is able to follow them. To conclude, however, that because they descend more than one or two thousand feet, therefore they continue to the centre of the earth, or to the supposed fluid mass, calculated to be from twenty-five to one hundred miles below the surface, is manifestly unreasonable. With the exception of superficial and gash-veins (see below), we may consider them as practically inexhaustible in depth, without assuming to say how far they go. With our present appliances, our operations are limited by the difficulty and cost of deep workings, not by the extent of the fissures in that direction.

The question, how fissures are filled, is also waived for the present. It must be admitted that the filling is generally a subsequent process, and there is no reason why it should not take place very slowly, through unmeasured periods of time. The changes that accompany and succeed it are those of position, (cross-fissures, of later formation, dislocating the vein, or fresh movements of the walls of the vein itself,) and those of composition, (oxidation, and other chemical changes, galvanic currents, molecular movements, concentrations, re-distributions, etc.) No doubt the form of the fissure influences the distribution of the vein-material, especially when the latter contains substances of different gravity, solubility, or volatility. For instance, vein-matter in solution or mechanical suspension would be more likely to be precipitated in wider parts of the vein, where the current would be slower. But these considerations are too nearly connected with most theories of vein-formation for my present purpose. I will only add one observation with regard to vein-material, which, like the foregoing, will, I think, meet with general acceptance; and then I shall proceed to deduce from the indisputable premises thus far established, a few practical conclusions, calculated, I think, to sweep away from the field of inquiry a great deal of unnecessary rubbish.

Nature has not regulated her operations by commercial rules. To her the distinction between valuable and useless minerals, rich and poor ore, is unknown. Many fissures are filled with granite, porphyry, basalt, etc., and are of no interest to the miner, except so far as they produce disturbances of ore-deposits. Of those fissures which are filled with metalliferous material, some are rich enough to pay for working, and some are not. The same vein is in one spot rich, and in another poor. These variations it is impossible to reduce to any general law, especially in the case of gold and silver. The former of these is always, and the latter frequently, an accidental constituent in the vein-material. One-thousandth of one per cent. of gold would correspond with $5 gold per ton of ore—scarcely a paying quantity; two-thousandths of one per cent. would be $10 per ton—enough, under favorable circumstances, to pay good profits. One-twentieth of one per cent. of silver would be about $19 per ton—too low for profit at any but the Comstock mines; and reducing this by one-fiftieth of one per cent. makes it economically worthless. It is manifest that changes so small as these cannot have the importance naturally which we assign to them commercially, and that we are not likely, for instance, to find out by what law the proportion of gold varies from one to two-thousandths per cent., crossing the arbitrary line of profit, which we, and not nature, have drawn.

The practical conclusions to be deduced from the foregoing remarks concern several theories and sweeping assertions popularly current with regard to mineral lodes.

1. It is said that "fissure-veins" increase in width with increase of depth. This is evidently, in view of the foregoing discussion, unfounded, as a general proposition. The width of a vein depends, first, on the original fissure, and the width of that is a function of circumstances, unknown and various. A force, for instance, pressing vertically upward until the crust is fractured, may make a fissure wider at the top than anywhere else, while a fissure produced by settling may be wider at the bottom. The width of a vein depends also on the degree to which a fissure closes, before and during the entrance of vein-matter. This, again, directly depends on the dip, on the occurrence of "horses," and on the speed and uniformity with which the vein-matter is deposited. Finally, the width of a vein depends on those movements of the walls which produce alternate wide and narrow zones or spots in the fissure. Now all these operative causes, though they may be partially investigated in a single given case, cannot be reduced to a general law; hence, *a priori*, there can be no general law that fissures grow either wider or narrower in depth. Experience signally corroborates this conclusion, showing that while veins of the same limited district may have a similarity of character in these respects, there is no uniformity that covers large regions or different conditions. But an argument that cannot be evaded is deduced from the fact that we have no standard of depth. I have frequently heard miners discussing whether their veins would "give out" at, say, six hundred feet, while the whole surface on which the veins cropped out had been so enormously degraded by denudation as to be already five thousand feet below the original level up to which the veins possibly extended. Until we can decide how wide was that portion of a vein which floods and glaciers and the slow work of time have swept away, we cannot very well attempt to argue that, because it is a vein, it must or must not widen as we sink our puny depths upon it.

2. It is said that fissure-veins grow rich in depth. But it is evident that this cannot be laid down as a general law. As I have shown, the variations which make a vein, according to our ideas, rich or poor, are frequently quite insignificent in intrinsic amount. The deposition of metalliferous matter in veins depends on the source from which they are filled, the manner and duration of the process, and the subsequent metamorphosis they may have undergone. The depth of any point below the present surface concerns only the last condition. Decomposition from atmospheric or meteoric agencies (a term which includes the action of air and surface waters) may alter a vein to a considerable depth. Where the valuable contents are soluble or easily decomposed, it may impoverish the vein. When they are insoluble and not easily attacked, the vein may be richer near the surface by the removal of non-valuable material. A probable connection in some cases between width of fissure and richness of deposits has been indicated above; but so far as this or any other cause is concerned, we cannot argue anything from the present surface, which is, in numerous localities, itself a section of the vein at great depth. Experience

* See the report of last year, p. 39, note.

confirms this view, showing that some veins are poor at the outcrop and richer below, while others show the reverse. We may fairly say that the valuable constituents of the ore (especially gold, and to a great extent silver also) vary according to local causes, and that lodes, as they are followed downward, are alternately richer and poorer—the accidental present surface of the country (meteoric action apart) being merely a section, crossing sometimes a wide, sometimes a narrow, sometimes a rich, sometimes a poor place. It does not follow that a rich outcrop will be followed immediately in depth by a poor vein, or *vice versa*, for the scale on which these alternations take place is variable, and frequently exceeds that of our mining operations. Besides, the terms rich and poor in this connection are merely relative to each other, and to each special case. The richest part of a vein may be too poor to work with profit, or the poorest part may pay handsomely. Rich ore in White Pine contains a hundred times as much silver as ore considered rich in Japan. The statement put forward on very high authority,* though based on incomplete observations, that gold-veins cease to carry gold at comparatively small depths, is now completely overthrown by experience. Mr. J. ARTHUR PHILLIPS† speaks the opinion now universally acknowledged, that gold ledges are not more liable than ordinary metalliferous veins to become impoverished in depth. What becomes then of the former observations to the contrary? In some cases, no doubt, a mere alternation or barren zone in the vein was mistaken for a complete cessation of the auriferous character. In other cases, no doubt, there was a total change in the vein material. That such changes do take place admits of no doubt. The mistake was in believing them to be universal and inevitable, and to have some direct connection with gold.

3. It is said that certain directions of course in veins have a decisive influence upon their metalliferous character. As the formation of the fissure takes place before its filling, this theory is *a priori* illogical. Experience equally condemns it, and indicates the true meaning of the supposed connection. It is true that, in limited districts, veins having a certain general course are frequently found to correspond in mineralogical character; but this is due to the nature of the process which opened the group of parallel fissures. The fissures of a certain epoch being sometimes parallel, and the same causes having filled them all, the resulting veins of that system or group may, in such a case, be quite similar; but it is the age, and not the direction, of the veins which effects this result. Sometimes groups of fissures of the same age are not parallel, but radiate from a common centre. In that case the significance of the course of a vein is nothing. Not infrequently the same group of veins possesses all the courses of the compass, and forms a complete network of intersecting fissures, so that even the local analogies of course have no weight. As for the sweeping theories, based on observations in one country or district, and boldly extended to all others, they are ridiculously absurd. I know of one instance in which a distinguished foreign engineer condemned without inspection a very productive gold mine as soon as he heard what was the strike of the vein—so far can prejudice or fancy warp the judgments of even educated men! The only general reason ever advanced for supposing veins of a particular direction to be richer than others, is a wild, vague theory of the influence of terrestrial magnetic currents, which will not bear inspection.‡

4. It is said that certain features of direction or shape are peculiar to gold veins; certain others to silver, etc. There are many different theories involving assumptions of this kind. But I have sufficiently shown that the form, direction, and extent of a fissure are not, as a general rule, essentially affected by the nature of the material with which it is subsequently filled; nor, if this effect were produced, would it be the infinitesimal proportion of gold or silver, but rather the predominating quartz, or iron pyrites, or galena, from which the influence would chiefly proceed. Many things are in fact predicated of gold deposits which belong simply to the accompanying iron pyrites; and many a returned Californian has discovered in the rusty boulders of his native village "all the indications" of a rich gold quartz.

5. In a word, there are in this sense no universal laws governing the dimensions, directions, changes, and metalliferous contents of veins. Every system or group, and, to some extent, every vein is a problem by itself. As I shall now proceed to show, we have discovered many different agencies more or less operative in such formations, and the degree to which each has influenced the result can only be determined, if at all, by patient observation of each special case. Every actively-engaged mining engineer ought to have a theory of the formation of the vein he is working, or at least such a knowledge of it as will enable him, after sufficient developments, to forecast with considerable certainty the results of future work. This can only be attained by carefully collating and preserving all observations made during the progress of the work. Not a change in the vein or country-rock, not a watercourse, seam, or horse should fail to be noted and recorded. Maps of workings, containing such information as this, are of the greatest importance; but I regret to say that those persons who are most ready with universal theories are too frequently the most neglectful of concrete facts. On the other hand, a large class of mining experts, believing that "nobody can see into the rock further than he can put a pick in," despise the whole science of mineral veins, and arrange their plans wholly according to the ore in sight. No doubt this is a more conservative plan. The engineers who follow it seldom get their clients into trouble by over-sanguine prophecies; but I think they frequently condemn good mines, and in this way occasion loss to owners. Of a new discovery, in a new locality, the less that is prophesied the better; but intelligent experts ought to be ashamed not to know something more definite about the nature, extent, and value of a mine after it has been developed by actual working. I refer particularly to those in charge, who have had the opportunity to observe, as operations proceeded, all the facts throwing light on these points. When drifts are timbered, stopes filled up or caved, and all fresh exposures altered by time, it is often too late to repair former neglect, and the best observer may be deceived or find himself at a loss.

[To be continued.]

* Murchison, Lieber, and others.

† Mining and Metallurgy of Gold and Silver.. London, 1867, p. 9.

‡ It is put forth in a book called, I think, "Geology and Magnetism," by Mr. Hopkins, an English mining engineer—a curious compound of careful and accurate observation in small local details, with loose generalization and disregard of scientific truths on the great scale.

Polytechnic Club of the American Institute.

Meeting held at the rooms of the Association, Jan. 12, 1871. Prof. S. D. TILLMAN in the chair.

Mr. PRATT exhibited an improved pivot for balanced sashes employed, especially in hotels, for ventilation, over chamber doors. The pivot is divided, and the elasticity creates sufficient friction to keep the sash in any desired position, in any ordinary current of air.

Mr. DAVID P. COBBY exhibited a model of an improved automatic car-coupling.

COMPRESSED AIR.

The PRESIDENT said: Dr. JOHN GORRIE of Apalachicola gave in the American Journal of Science and Arts, in 1850, a very full account of experiments made by him at New Orleans, for the purpose of ascertaining the quantity of heat evolved from air by mechanical compression, and presented the results of each series of experiments in tables so arranged that a simple inspection of their columns disproves the deductions of DALTON and LESLIE, that the evolution of heat from air was directly as the reduction of its volume. He says: "In the experiments, as recorded, all preconceived notions of a uniform law of progression of any kind were set aside, and nothing is regarded but the quantity and tension of the materials employed, and the indications of the thermometer. The experiments, indeed, show that if there is any precise law of progression, or fixed relation between an increase of tension and the amount of heat set free in air by it, it must be in inverse and rapidly-diminishing ratio. Thus, the quantity of heat generated by compressing air to half its volume is, as shown, sufficient to elevate the temperature of an equal weight of water 74° F., and of its own body 277°. When it was reduced to one-fourth of its volume, the increase of heat became for water 105° F., and for air 395° F,; and when condensed to one-eighth of its original volume, the heat was for water 125° F., and for air 472° F.

According to these observations and deductions, while the density of air increased in the geometrical progression 2, 4, 8, the heat evolved corresponded, nearly, to the arithmetical series 3, 4, 5. But the ratio in the differences of temperature between the assigned densities followed a very different rate of progression from either; thus, for the densities 2, 4, 8, atmospheric pressures, the corresponding differences of heat evolved were in the decreasing numbers 277, 118, 80, nearly as 3.5 : 1.5: 1.

He admits that more reliable philosophical instruments and still more extended series of observations only will justify the attempt to establish a natural law from these deductions; yet, notwithstanding the imperfection of the instruments and machinery used, he believes they cannot be in error to any considerable extent, and does not hesitate to commend them to public confidence.

Prof. VANDERWEYDE—JOULE, in 1840, made a great many experiments, much more perfect in their character, for the same purpose; and it is surprising that Dr. GORRIE knew nothing about them. His object was to determine the mechanical equivalent of heat. Experiments were made by scientists in 1830, by which they found that the temperature increased at a less rate than the compression. But their experiments are considered of no permanent value, because they omitted to take into account the heat of the vessels in which the compression took place. JOULE corrected that. He surrounded the compressing vessels with a known volume of water at a known temperature. Upon compressing the air, the amount of heat evolved was manifest. But corrections were necessary, because the heat produced was not due altogether to the compression of the air. First there was the friction of the pump, and then the friction from stirring the water. In order to determine what correction to make, he moved the piston and stirred the water in the same manner without compressing the air, and observed the amount of heat evolved; which, being subtracted from the former amount, left the amount due solely to compression. In that way he determined with great accuracy the increase of temperature corresponding to any compression, which is well known as the mechanical equivalent of heat, the relation between the foot-pound and the temperature. Dr. GORRIE did not know of these experiments, and the reason his results were different was simply that he did not take into account the cooling of the air in the vessels in which it was enclosed. The specific heat of air is very small, being only one-fourth of that of the same weight of water, and only 1-3200th part of that of the same volume of water. A cubic inch of iron will absorb as much heat as nearly 4,000 cubic inches of air. It is therefore exceedingly difficult to make these experiments, and absolutely necessary to allow for the heat of the containing vessel.

The PRESIDENT—JOULE merely demonstrated by experiments, which lasted eight years, that the law announced by MEYER was correct.

J. F. HASKINS, the Superintendent of the Burleigh Rock Drill Company, the manufacturers of the air compressors used in the Hoosac Tunnel, read the following paper:

MR. PRESIDENT AND GENTLEMEN: I was advised a few days since by mail by an old friend, that he had made an appointment with you for me to lecture before your association this evening. You will remember, Sir, that I at once wrote you, that lecture I could not, but gladly would I meet you and your friends, and add what I could to the limited information extant upon the subject of compressed air. I am perhaps as familiar as the most practical mechanical engineers with the subject. From long connection with it, my experience has been varied in both cold and hot compressed air, and to-day I regard them as the coming enigma or mechanical nut to be solved and cracked. I use the phrase "mechanical" literally, for science seems all at variance. Well do I remember reading the story of the large blast pipe erected in England to convey air from one set of blowing engines to two stacks some distance apart, as I remember it. They built the air conduit of brick and metal, with sundry turns and crooks. On starting the engines, they got no air through the long pipe, fault was found with the constructor. He insisted that there was a hole through, and to prove it, he put in a cat. She came through almost immediately; but they never could get any blast through. To-day the reason is obvious, and we will come to it shortly.

The student, in searching for information on this subject, is met at once by that stern law as to the resistance of the flow of air in pipes, and judging from the numerous queer questions we who are in the trade have to answer, one would conclude that they never go beyond this meeting. The law runs:

"The resistance increases as the square of the velocity, and is further augmented as the square of the quantity."

You will smile when I tell you that this is both true and false. True as they determined it, and false as air is to-day conveyed and handled. The practice of to-day carries at Mount Cenis air at 50, 60, and 70 pounds to the square inch 4 miles in pipes of 8 and 10 inches diameter, and under my own eye—at Hoosac tunnel, Massachusetts—we are daily carrying air at 60 and 65 pounds one and three-quarter miles with little or no loss. Nor are either of the above the first or only instances of long conducts. They are numerous, and in pipes from 1 inch to 8, 9, and 10 inches. In the business in which I am, and have been engaged for some years, that of designing, building and operating air-compressors and rock-drills, we are frequently called upon to carry air at high pressures long distances, and we daily meet instances where it would be impossible to do so, were the above law true. This is one of the numerous instances wherein practice is always of value, and it is to give you, Sir, and the world the benefit of some of that practice that I am here to-night, and I shall esteem it a pleasure to reply to any questions which any may have to ask.

My first connection with the subject dates back to 1858, when as foreman of an establishment in Massachusetts I entered upon the manufacture of Ericsson's caloric engines, air-compressing pumps, and machinery to be run by them. So to that wonderful engineer, JOHN ERICSSON, I was indebted for my first knowledge on the subject, and first opportunity to gain further information; and I do not hesitate to say that had he been left entirely untrammeled by others patenting modifications of his great discoveries, the world would to-day be using a large percentage of compressed air where steam is now used. It is a very unfortunate fact, but fact it is, that this interference locked up an immense amount of information which will see the light but gradually. Just now, we find parties almost daily inquiring if they can convey air various distances, and run machinery with it. Most certainly you can, and that economically too. There are numerous instances on record where it was done long years ago, and to-day I can point to very many places where it is being done daily, and creates no wonderment.

In this city of New York, many years ago, came a clothing firm to Capt. ERICSSON for relief, in the way of power to run sewing machines. The relief was readily furnished, and a caloric engine in the cellar compressed the air; it was carried to the upper story in pipes, and there moved little engines, which, in turn, operated sewing machines to the number of some eighty. And this was not all, the act of compressing air throws off its heat, and then when it is again exhausted, it of course takes up that heat again from the surrounding atmosphere, doing two things, condensing and precipitating the vitiated air, and furnishing one of the best possible means of ventilation.

These machines worked successfully for years, and were only stopped when business lagged. This was in 1858, or 1859, and yet were it to be repeated to-day, every New York daily would contain double-leaded articles on the subject, and the world would be astonished. About 1853, or 1854, at Glasgow, Scotland, there was built from the designs of Mr. DAVID ELDER, an air compressing engine, known as "Randolph's Air Pressure Engine." This engine compressed air to 20° and 30°, it was then conveyed down to the lower level of the mine, and there actuated an engine similar to a steam engine, to do the needed pumping. It ran for years successfully and economically, and yet the world has never known it. It is being done to day in various places, using ordinary pumps, but as the world moves, this plan is now to be superseded by a much simpler plan, compressed air still being the motor, but without the intervention of an engine. We wil speak more of this, further on.

Now, were the above law literally true always, I fear some of these things might not be accomplished. Within a year there has been a great deal said and written as to the *possibility* of running horse cars by means of compressed air. Any one might have learned upon inquiry that such a thing was not only possible, but that it had been done on a small scale a dozen years ago. I, jointly with a friend filed a caveat, in 1858, at the Patent office, after a series of successful experiments, extending over some months, for doing so; and to-day cars are running so driven, and there is not the slightest reason why they should not. We might go on almost indefinitely multiplying instances of different things which have been done years ago by compressed air, and which are just now coming up again; this time, I trust, to be generally adopted for the good of the world at large. I am in my daily practice often reminded of him who was once told he "could not do a given thing." His reply was: "But I have done it." And so I often find myself amused in this direction by those who "wonder if a given thing can be done."

GEO. STEVENSON was instructed by his backers not to say to Parliament that he could build a locomotive which could be made to run thirty miles per hour, for fear of defeat. I am in much the same condition, for I dare not tell all I know or believe on the subject for fear of disbelief. And yet, let me say to you, Sir, that if you pursue the study of the subject you will be astonished at the amount which has been, and is being, done in this direction; and I know of no more agreeable pastime than the chasing up of this matter. Whenever the subject of compressed air is mentioned in American papers the Mount Cenis tunnel comes in for a large share of the article; and yet, within 200 miles of this city, the Hoosac mountain is being daily pierced at either end about five feet, by means of the Burleigh rock drills, using compressed air as a motor. Near Mauch Chunk, Pa., 100 miles from here, a railroad tunnel is being driven under a mountain by the same agency. There are numerous other places where the same is being done; and yet how few of the people know anything about it. Your own East River bridge—the lamented JOHN A. ROEBLING'S last and greatest work—could not be constructed on that plan but for compressed air. To the westward, we find at St. Louis Col. EADES erecting an immense bridge, and sinking his piers by means of this same subtle agency—for subtle it is, the law to the contrary notwithstanding. These are on the caisson-sinking principle; while east and west they are driving piles for piers by compressed air; and were I at liberty to make use of the information, I might add several other uses to which it will ere long be applied.

We have seen, then, that compressed air is a reality, and now a little of its production; and here let me say that we can, of necessity, touch but lightly on any one's plan, as they are many, and yet there are but few which are really of utility, or are commercial successes. They may be named as within three classes: "The water column;" "the piston immersed in water;" and "the piston simply packed and lubricated by water or other fluids."

Of the first class there are several varieties; all, so far as

my knowledge extends, have in them elements of success. They operate upon the general plan of starting and stopping a column of water. Those at Mount Cenis have been very successful and economical. They have small engines actuated by compressed air, which operate the induction and eduction valves. They are placed at an inclination, drawing their supply of water from cisterns, this insuring clean water. With them they compress air to sixty and seventy pounds to the inch, and sometimes more, as they may require. Other apparatus, depending on a column of water for its power, has been constructed, and there are several parties now experimenting in that direction. It is a grand field—open to, and inviting, the attention of the mechanical world—and few fields offer greater inducements.

Of the immersed class of compressors there are also several. They do well for low pressures, but not as well for high ones, the difficulty being that the piston, in moving, has also to move a large body of water, which, of course, absorbs an amount of power equal to its own inertia. The names of ERICSSON, SOMELLIER, DOANE, BUTLER, BURLEIGH, SPEAR and HASKINS appear as inventors of the last class, and among them they have indeed produced some queer machines, and surmounted what in years past were considered almost insurmountable obstacle.

We come now to the transmission. In my judgment (and I speak from experience) there is not the slightest difficulty in doing so. Returning to the cat story: in my judgment, had they drawn in the end of that blast-pipe a little, the air would have come through about as readily as the cat did, and without half the fatigue. I regard the proposition of Mr. DAY, to harness the lower Genesee Falls and convey its power to Rochester, as more than feasible. It is only necessary to have the conduits large enough. I should not hesitate to stake what little reputation I have on a successful result, and I think we have seen above that there are instances enough of success to refer to, to warrant such a declaration. Once success is demonstrated there, how many other similar spots can be found to apply the apparatus to! Think of the immense number of uses to which the compressed air can be put, when it can be had by turning a stop-cock in each house, as you now turn on and off your gas.

Mr. ROBT. SPEAR, of Portland, Me., has invented numerous devices in connection with compressed air. Among them a pump, for use in very many places, as mines, deep shafts, houses, and other places where steam will not answer. It has a great deal of merit, and furnishes a means, long needed, of doing the class of work above mentioned. He also has a system of pipe for transmitting air, which is a departure from all settled plans, and yet it promises success. So almost daily the army of inventors are aiding the great cause, each by his little addition to the general whole; and let us join that progressive party and aid the onward march to more air, and that compressed. To turn, spin, weave, print, carry, cut, mend, break, warm, cool, propel, and stop for us; until it shall do safer and better for us what steam now does, and many things which it cannot, not forgetting that very important matter of ventilation.

Mr. HASKINS illustrated upon the black-board the construction of the machinery in use, and, in reply to inquiries, stated the following additional facts:

The air being compressed in a cylinder of 14¼ inches diameter, and 15-inch stroke, running 90 strokes per minute, is cooled by introducing a spray at each stroke consisting of two gills of water, being discharged at an advance of about 40° F.

The power applied is from 40 to 60 horse power. The power actually used is about 8 horse power. It was desired to have a large surplus of power, and the air not needed for power is used, and very important for ventilation. The company sell their best form of air compressors under the guaranty that they shall give back 75 per cent. of the power expended; and their estimate was, that but 19 per cent. is lost under proper management.

The apparatus is so arranged that in the revolution of the crank of the steam-engine the position of greatest power shall correspond with the close of the motion of the condensing piston, where there is the greatest resistance. As little space as possible is left in the condensing cylinder for air, which will be expanded again upon the retreat of the piston. The thickness of writing paper is all the space usually left.

The power had been shown by indicator cards; but it was no easy matter to determine the exact amount of power while the machine was striking 300 to 400 blows per minute. He had therefore no means of determining with accuracy the proportion of the power actually lost in the works at the Hoosac Tunnel.

The pamphlet published by the Burleigh Rock Drill Company, contains a table showing the result of experiments made at Hoosac Tunnel, the air being carried 7,150 feet through 8-inch iron pipe, giving the difference in pressure at the compressors and at the heading of the tunnel; but that table was unreliable. They had succeeded in getting cards varying about 1½ lbs., with either a 4-inch cock open at the other end, or the drills running. On the average, as the pressure increases, the difference decreases.

HORACE H. DAY corroborated by his own experiments, the estimate of Mr. HASKINS, that 19 per cent. only of the applied power would be lost.

Prof. VAN DER WEYDE.—The amount of loss from the use of compressed air depends upon principles which are pretty well settled. There is no doubt that there is a loss by the heat evolved. Wherever you generate heat, you lose power, and Dr. BONAIRE points out exactly how much. We can predict what expansion of air will be produced in heating air; and by reversing the process we can predict what amount of heat we shall get by compressing the air. We know that air doubles its volume when we heat it 4,80° Farenheit. But when we keep the volume the same, and double its pressure, we do not require so much heat. There is a distinction between heating air to a certain pressure, and heating it to a certain volume. When we heat air, and use the air to lift a piston, and perform labor, we lose a certain amount, and that amount is what we lose in machinery which compresses air. It is an error to suppose that when the air employed to do work, the lost heat will be returned. It is an end to calculate the foot-pounds required to compress air into a cylinder, as the power to be obtained from that compressed air. When we lift a weight we do not produce heat; and when the weight comes down we get all the power back. But when we generate heat we lose power. We cannot possibly compress air without producing a certain amount of heat. And it appears from the experiments of JOULE, that the greater the compression, the more heat we lose.

Were the experiments of JOULE to be repeated, we might improve upon them; for we could determine how much ice is melted during the compression; but I have no doubt that the experiments, whenever proper care is taken, will confirm the principles already laid down.

There is an advantage, which it may be interesting to mention, in using a gas which may be liquefied. In the use of compressed air, the more air we put in, the greater the pressure. But if we use a gas which liquefies at a pressure of eight atmospheres, we may continue to introduce that gas, and it will be liquefied, without increasing the pressure, until we shall have stored up an amount capable of keeping up that pressure, which, if restored to the form of a gas, would produce a pressure equivalent to eight hundred atmospheres.

Carbonic acid gas may be liquefied, and has been used in that way; and it worked very well for a short time, but it soon became so cooled that it was necessary to stop the engine until the heat could be absorbed.

Another advantage of ammonia is the great rapidity with which it is absorbed by water. When the ammonia has been expanded and done its work, it is discharged into water, which absorbs it, and becomes heated. That heat is utilized in the heating of the liquefied ammonia, and the water is thus kept cool and ready to absorb the ammonia.

But for stationary engines there is no more valuable engine than that employing compressed air, and it has the advantage of giving ventilation. I believe the gentleman will agree with me that the Hoosac tunnel would have been entirely impossible to construct if it had not been for the use of compressed air for the double purpose of ventilation and driving the machinery.

Mr. HASKINS—Certainly. I think so.

Mr. J. K. FISHER suggested the employment of hydrogen gas, to be compressed, and, after its use for power, to be burned to heat the gas on its way to the engine.

The PRESIDENT remarked that coal gas would answer the same purpose, and be less expensive.

Mr. BLANCHARD—Would not this plan be equivalent to using milk on a water wheel, and using the milk afterwards? (Laughter.)

HORACE H. DAY—Among the most interesting points made by Mr. HASKINS was the announcement that two gills of water was sufficient to keep the air cool. I will ask him, if his experience will enable him to answer, suppose the whole volume of the water comes upon the air to be compressed, so that the air passes from the compressor without being heated, is there any loss of power from the heat, or is the air really heated?

Prof. VAN DER WEYDE—The compression of the air heats the water. If there are but two gills, the amount is easily perceived. If there is a larger amount of water the same heat is lost, although not so readily perceptible. Two gills, heated 40°, is about equivalent to a whole unit of heat. But that is not all. When air is compressed, its capacity for taking up moisture increases; and in addition to the water heated 40°, there is a portion of it which becomes vapor, absorbing 1000° of heat. When we compare the amount of heat with the quantity of air to be cooled, which has so little capacity for heat, this result is not surprising.

The PRESIDENT—We should not estimate the value of compressed air altogether upon the basis of the amount of power lost. Suppose there is a loss of twenty-five per cent.; that is a mere bagatelle, compared with the uses to which air can be put by means of waste power. This discussion has been chiefly in view of the importance of using waste water power, which is one of the greatest problems ever presented here, and one which is destined, I think, to be worked out in a short time, and perhaps completely, by Mr. DAY.

Prof. VAN DER WEYDE—Suppose three-fourths of the power of Niagara Falls should be wasted; the remaining fourth would be a blessing to the city of Buffalo.

The PRESIDENT inquired of Mr. DAY how he proposed to make his air tube tight.

Mr. DAY—We shall have slip-joints; but expect to avoid the expansion and contraction mainly by putting it under ground. It should also be lined throughout with a suitable varnish.

The PRESIDENT referred to SPEAR'S new pipes, as unphilosophical. If contracting the pipe at intervals was of any value, the contracted places might be multiplied until the pipe became wholly of the reduced diameter.

Mr. ROBERT WEIR said that the contractions appeared to him a poor substitute for an air-chamber.

Prof. VAN DER WEYDE said that at the time the water was let into the pipes at Chicago, those who watched for its coming had to wait an hour and a quarter for the air to come out, and when the water came at last, it came in a shallow stream of dirty water, running over the floor, which gradually rose.

The thanks of the meeting were tendered to Mr. HASKINS for his paper and explanations upon the subject of compressed air. Adjourned.

Before the adjournment of the Club, it was proposed to introduce a resolution embodying the opinion of the Club upon the subject. The President remarked that it was contrary to the present custom of the Club to express by motion any opinion upon a subject presented for discussion. He thought, however, that a general opinion of the great value of this method of transmitting power was prevalent with the members.

The New Jersey Agricultural Society—Annual Meeting.

AT the annual meeting of the New Jersey Agricultural Society, held on the 18th inst., the Executive Committee, in an able report, announced that the Society, during the past year, had, without aid from the State, become nearly self-sustaining, proposed that the Legislature should be petitioned to establish and support a bureau of statistics and agriculture, which could not fail to be of service to the entire State. The late geological survey of the State, by which the locations of valuable beds of marl, veins of iron and other ores, have been pointed out, and by which the condition of the lands under water has been examined, was highly praised. This report estimates the number of acres of meadow submerged land in the State at 295,000, most or all of which could be easily reclaimed, if a regular system of doing so was attempted.

Railway Gauges.

THE following article from *Engineering* is in reply to the report of Mr. G. P. BIDDER, upon the introduction of the narrow-gauge system of railways in India. Our contemporary, with great fairness, gives six columns to the letter of Mr. BIDDER, and contents itself with less than three for the reply, which we reproduce almost entire. We think it unnecessary to publish the original letter, since the main points of the argument have been fairly stated in the answer, and our only object in giving any attention to the matter is to diffuse information upon a subject which is, we think, destined at no distant day to become an absorbing one in our own railway circles, as well as a matter of great importance in the political economy and rapid growth of our Western and Southern States:—

"An exceptional *toy line*." So Mr. G. P. BIDDER, with a characteristic sneer, defines a narrow gauge railway in his report to the Sind and Punjab Railway Company. It will be admitted, we think, without hesitation, that this definition is a graceful testimony to the practice and the opinions of those who have developed the theory of narrow gauge railways to a successful issue, and of those who, after due deliberation, have recommended the adoption of such lines to the Indian Government. We have already fully commented upon the report of Mr. JOHN HAWKSHAW to the Eastern Bengal Railway Company, and we believe it only just to examine this also. It would be difficult to find a greater contrast than exists between these two documents. We differ, in conclusions, from Mr. HAWKSHAW, but we bear willing testimony to the care and thought displayed in his report. It formed, indeed, a sustained argument from first to last. Now, Mr. BIDDER'S report is nothing of this kind. It consists of a number of heavy dogmatisms, with here and there a trite remark, time-worn as a sea-shore pebble, strung together on a slight thread of argument, that we fear does not add much to the strength of the whole.

Let us note paragraph two. Mr. BIDDER feels the greatest surprise at the Government venturing to reopen the Indian gauge question, which he had supposed to have been long ago finally settled. India is blest with a railway system extending throughout the "length and breadth of that vast empire," constructed with a wise judgment. The expression length and breadth implies, one would think, that the entire area of India had already been covered, or was being covered, with a railway network, and in spite of the difficulties besetting such a supposition, we cannot divest ourselves of the belief that Mr. BIDDER is in ignorance of the real requirements of India with regard to railway matters. He is impatient at the rediscussion of the question of gauges after it was settled so thoroughly in 1846. The Indian Government are acting most unadvisedly; they have not considered the matter; their policy is suicidal; they must be reasoned with on the subject of a change of gauge; they must take the "sense of those whose judgment and experience in railways and railway economy qualify them to give authoritative opinions on the matter," and not be led by their own blind ignorance. Of course, as all the world knows, the Indian Government has taken the "sense" of those qualified to judge; and we have so much respect for that Government as to feel confident that they are tolerably well informed as to the means, the trade, the prospects of India, and are able to understand that, of two evils, a break of gauge and no railways, the former is preferable.

Mr. BIDDER, of course, brings forward the Great Western Railway as evidence of the folly of exceptional lines; as if the Great Western Railway and its conditions were in any way parallel to those of India. We would here call attention that the statements made concerning this railway are very contradictory. On one occasion the great expense involved by the exceptional gauge is mentioned; yet but a few paragraphs farther, we find that the Great Western cost but 7 or 8 per cent. more than the 4 feet 8½ inch railways. To be sure this latter statement is made when the question of comparative cost is alluded to, which possibly explains the discrepancy.

In considering the comparative costs of broad and narrow gauge lines, Mr. BIDDER'S remarks are either strikingly threadbare, or vividly original. The widths of cuttings, over bridges and tunnels, have nothing whatever to do with gauge; they are dependent solely upon the breadth of the rolling stock. Before we knew this, we should have imagined that the width of carriage had some remote and indirect connection with the gauge. The cost of land, we are told, would be the same upon the narrow as upon the broad gauge. The cost of land would not be the same; it would be less but only a little less, as Mr. HAWKSHAW has mentioned in his able report.

Mr. BIDDER states, as an undeniable fact, that the cost of a line is measured, not by the *gauge*, but by the *quantity of traffic*, and the speed at which that traffic is required to be carried. Yet the broad gauge was extended into the centre of England at "an enormous expense."

Are we to read this statement of Mr. BIDDER'S with the paragraph above quoted, or are we to take the more reasonable statement (which is not correct, by the way), that the extra cost was only 7 or 8 per cent. more for the broad than the narrow? These two conflicting statements somewhat mar the

harmony of the report. And we may here note that "the cost of land and works" for the Great Western Railway was "considerably increased," yet before we are assured that "the cost of land, stations, and other necessaries would be in any case the same." We note these points particularly, because they really should be cleared up.

Returning, however, for a moment, to the abstract assertion that the cost of a line is measured by the quantity of traffic to be carried and the speed required, not by its gauge. Corrected, this sentence should read thus: *The quantity of traffic*, and the *speed* at which that traffic is required to be carried, decide the *gauge*, which should be the measure of the cost of the line. We have on previous occasions proved that the capacity of a 3 feet 6 inch line is ample for all the requirements of India, and Messrs. STRACHEY, DICKENS and RENDEL have taken much pains to show that a still narrower gauge is sufficient, while upon the question of economy of construction Mr. FOWLER's careful estimates speak for themselves. In this case, therefore, of the Indian railroad extensions, it is the gauge which determines the cost, that gauge having been determined from the quantity of traffic and speed required. Moreover, these two elements are quite independent of some of the most costly items of railway construction, which are seriously affected by the width of gauge.

The observations upon the cost of light railways should be taken in connection with Mr. BIDDER's estimate for altering the gauge of the Sind and Punjab lines 320 miles in length. With regard to the former, instances are put forward of cheap 4 feet 8½ inch lines in England, built to accommodate poor districts, where, with due economy, a cost of only some £4,000 a mile has been incurred, and such lines are recommended for India upon the 5 feet 6 inch gauge. We need not consider the approximate cost of such railroads. Mr. HAWKSHAW's report considered this question, as we saw last week, and that with no vague generalities of little real utility. We may fairly assume that this sum of £4,000 a mile, including expensive land, would, in Mr. BIDDER's estimation, approximate to the cost of similar railways in India, and bearing this in mind, we will now proceed to analyze his estimate for altering the width of the Sind and Punjab Railways, and of the contingent works. The cost of shifting a single rail, so as to alter the gauge to 3 feet or 3 feet 6 inches is set down as between £300 and £400 a mile. Now, if shifting one rail 2 feet or 2 feet 6 inches, and securing it in its new position, would cost Mr. BIDDER £400 a mile, how could he build a new line for £4,000 a mile? Moreover, it is asserted that this change of rail could not be effected without entirely stopping the traffic, and entailing all kinds of evils. But, for our part, we cannot conceive for what reason the traffic should be stopped during the alteration of gauge; interruption to trains (unless the traffic be very important) we should have imagined would have been the last idea that would have entered into the mind of the engineer entrusted with the work. But further on we find that £300 does not include contingencies, which would bring the cost of altering the gauge, for a length of 320 miles, to £250,000 or £300,000, that is to say, £780 a mile to alter the width between two rails, how could he build a railway complete for £4,000 a mile?

Besides this, however, there would be required an exchange station to be erected at the point where the unavoidable break of gauge at Lahore should exist. And the cost of this work is placed at £100,000. But we have not yet done. There is the new rolling stock to be provided, and all the other elements of expense, with contingencies, loss of sunk capital, and so forth. Mr. BIDDER says upon this point: "It is beyond my power to estimate all the cost with any pretensions to accuracy .... but I believe it would not be safe to estimate .... so great a change at less than a million sterling." This is a climax; £3,125 a mile for altering the gauge of the Sind and Punjab Railway and stocking it! It will be noted that subsequently this sum of a million sterling assumed indefinitely as the cost, which it is impossible to estimate, is afterwards taken by Mr. BIDDER as the *exact* measure of expense that would be incurred.

It would be superfluous to discuss Mr. BIDDER's opinions upon the impossibility of moving troops and war material on a three feet six inch gauge, but we imagine that the experience of a member of the Engineers' and Railway Volunteer Corps cannot be of so much value as that of Messrs. STRACHEY and DICKENS, who, however, err upon the other side. But we must call attention to the paragraph of the report wherein allusion is made to this subject, and from which it will be at once evident that the author has either not properly studied the question, or that he is so obstinately prejudiced against advancement in railway matters that he blinds himself to facts which other engineers have long since acknowledged.

We now come to the last point we propose to criticise. In a letter appended to the report, and addressed to Mr. ANDREW on the 6th of July last, Mr. BIDDER, referring to the proposal of the Government to narrow the gauge from Lahore to Peshawur, remarks that, out of the 270 miles proposed, but thirty miles present any serious difficulty, and these difficulties are created by the injudicious selection of the route. It would appear, therefore, he proceeds, that upon these scanty grounds Government would seek to justify a conclusion that would inflict an irreparable injury upon the Indian railway system.

After this, we can come to no other conclusion than that already named: that Mr. BIDDER, at the date of penning his report, was in total ignorance of the object of the Indian Government in suggesting a change of gauge, and that he did an injustice to the Government by supposing it capable of such a monstrous purpose as to isolate a railway district for the sake of building thirty miles of lines more easily and more cheaply. Mr. BIDDER evidently did not know that not thirty miles, but twice 3,000 miles of line have to be built upon a narrow gauge, and that the contemplation of altering the Sind and Punjab Railway will probably be succeeded by a similar consideration with regard to many other Indian lines.

Moreover, besides failing to grasp the purpose of the Government, Mr. BIDDER does not comprehend the question of narrow gauge railways and all that it involves, or rather, we should say, he will not understand, for how else can we explain the wonderful feats of figures that appear in his report? We believe that by this time comparatively few engineers remain unconvinced as to the necessity of adopting a narrow gauge for new and poor countries, or the advisability of submitting to the disadvantages of a break of gauge in India for the increased benefits the three feet six inch second-class lines would confer.

One more point, and we have done. Mr. BIDDER has seen fit, in defiance of custom and of good taste, to make his report a vehicle for personal aspersions. We warmly protest against this, and we believe that every member of the profession who reads the document in question upon another page, will agree with us in condemning so unusual and reprehensible a course.

Abstract of a Paper on the Absorption of Sulphur by Gold, and Its Effects in Retarding Amalgamation.*

By WILLIAM SKEY, Analyst to the Geological Survey of New Zealand.

THE author of this paper, while recently investigating the causes of the reported loss of gold during the process of extraction at the Thames gold fields, observed that much of this loss could scarcely be referred to any of those causes generally supposed operative for it. He therefore tested the actual condition of the natural surfaces of numerous specimens of Thames gold, in respect to their behavior with mercury, and examined further than has hitherto been done into its comportment with several of those substances likely to be associated with it in a natural way. The results of these examinations have been minutely recorded in this paper, while the following is a short abstract of them. The author finds:

(1.) That numerous samples of bright, clean-looking gold, of all degrees of fineness, refuse to amalgamate on any part of their natural surfaces, though taken directly from the reef and untouched by hand.

(2.) That on such surfaces sulphur is always present.

(3.) That native gold, or gold in a pure state, readily absorbs sulphur from moist sulphuretted hydrogen or sulphide of ammonium, and absorbs it directly when administered in boiling water.

(4.) That surfaces so treated refuse to amalgamate, though no apparent change can be observed in their aspect.

(5.) That gold so affected is rendered amalgamable by rasting in an open fire, unless copper is present to the extent of seven per cent., (or perhaps less) while the same effect is produced by the contact of cyanide of potassium, chromic and nitric acid, and chloride of lime acidified.

(6.) That this absorption is altogether of a chemical nature.

(7.) That sulphates of iron, in presence of air and water, decomposed various metallic sulphides common to auriferous reefs, in such a manner as to liberate sulphuretted hydrogen.

The action of sulphuretted hydrogen upon gold, in rendering it non-amalgamable when placed in contact with mercury, was demonstrated with striking effect by the author before the members of this Society.

From these results the author has been led to suppose that a large area of the natural surfaces of native gold is covered with a thin film of an auriferous sulphide, and that the greater part of the gold which escapes amalgamation at the battery, is represented by that portion of this sulphurized gold which has remained unabraided during the processes of milling or extraction from the reef; the state of the gold, rather than that of the mercury, therefore, being the greatest impediment to thorough amalgamation.

In addition to these results, the author communicated others relative to the effect of solutions of sulphuretted hydrogen and sulphide of ammonium upon platinum. In rendering it non-amalgamable, he believed a sulphide of the metal had formed in each case, since chromic acid rendered it again amalgamable. He also stated that this metal is also so affected by ammonia or the fixed alkalies that it will not amalgamate, except in presence of a mineral acid, from which he suspects platina is capable of superficial oxidizement when in contact with alkaline substances, even at common temperatures. The author found that his samples of gold were not affected by the alkalies in this manner, except in the case of one from Victoria, a singularity from which was argued the presence of palladium in this particular sample.—*Chemical News.*

*Read before the Wellington Philosophical Institute, September 17th, 1870.

MINING SUMMARY.

MINING REVIEW FOR 1870.

California

(From the San Francisco Bulletin.)

The year just closed has been marked by such a general improvement in our mining industry as to encourage the hope that its history is about to be signalized by the advent of a new and better era. Nor has this improvement been restricted to a single branch or the mere details of the business. It seems to have been radical as well as general, going to questions affecting stability and permanent production, as well as mere local or temporary gains. In fact, the manner in which mining, especially most large enterprises, had been engaged in and conducted, both in California and elsewhere on this coast, such that without some reform it could not have been continued to any great extent, so generally disastrous were the results attending it. The speculative and even fraudulent character of many transactions carried on in its name, the manifest lack of skill and good business management, coupled with the exactions of labor, were tending to render the pursuit disreputable as well as financially dangerous.

Conducted after this style from the first, mining affairs had gone on from bad to worse, passing through the various speculative paroxysms and depressions that grew out of the Washoe and other discoveries, until these evils, culminating in the White Pine excitement, caused a grand explosion, bankrupting many of its victims, and so terrifying others that this interest for some time after suffered an unusual depression. But these severe reverses taught us a useful lesson; and one which the mining community generally has had the good sense to profit by. It came to be seen that the entire system of operating must be changed, or all hope of profitable mining must be abandoned. In this extremity nothing remained but to give it up or initiate the needful reforms. As the results of electing a trial of the latter alternative, we have the above-mentioned very considerable and gratifying improvements to record.

To summarize a few of the more important gains lately effected in connection with our several mining industries, it may be observed, first, that a much more cautious and business-like policy has been pursued in the application of funds, whether used for the purchase of mining properties or in the adoption of means directed to their exploitation and the utilization of their contents. In this particular the change has been marked—so much so, indeed, that we cannot now recall a single instance of any large mining enterprise, having been inaugurated within the past twelve months that was not pioneered by the observance of every precaution that prudence could dictate, and that does not seem to have been afterwards governed by an able business administration and a judicious economy. It has been the practice in all these cases to procure examinations of the entire field to be first made by one or more experts of capacity, practical skill and unimpeachable integrity. Frequently, for the purpose of insuring greater security, this reconnoisance has been repeated either by the same or another party. These preliminaries through, if attended with a favorable report, the services of an experienced and every-way competent mechanic are apt to be secured to draft the plans for a mill, supervise the construction of the machinery, and put the whole in place—equal care being exercised in making choice of a superintendent for the mine, as well, also, as for the mill, and other subordinate officers.

It is also noticeable that much more perfect and powerful machinery is now being procured for use in the mines than was formerly the case—thereby increasing capacity, saving labor, and guarding against breakage and the necessity of frequent replacement. The habit of buying up old mills, modeled after early patterns, and removing them to new districts, at one time much in vogue, and specially prevalent during the White Pine furor, has been mostly abandoned; these establishments, though costing less at first, having been found unprofitable in the long run. Some of the most signal failures in White Pine were solely due to this mistaken policy. There was, however, then, some excuse for this course, these mills, besides their cheapness, being conveniently at hand, while the trouble and cost of bringing in new ones was great, this being before the railroad had been extended far enough East to afford facilities for that purpose. With the foregoing precautions well taken, one half the defeating causes of practical mining are effectually canceled.

After what has been said in this connection, it is useless to add the correlative fact that there has ensued a manifest abatement in the sale of fancy mining stocks, as well as of all other properties of this kind possessing a merely hypothetical value. The Stock Board will, of course, continue to operate in shares of the most unsubstantial and shadowy kind; but the people at large have about desisted from dabbling in these "airy nothings," as well as from buying into mining claims of which they have no certain knowledge.

In sympathy with these restraining influences, shares in productive and really valuable mines, while tending to appreciate, have exhibited less extreme and fewer sudden changes the past year than usual, their fluctuations having been restricted to a comparatively narrow range.

The mischievous combinations which, under the name of

LABOR LEAGUES,

caused so much injury a year or two since, both to their own members and their fellow-workmen, while they seriously retarded the development of the mines by discouraging investments, have, except in a few localities, been practically disbanded, or at least have so far modified their policy as to no longer assault and murder their companions for no other offence than exercising their natural right to work for such wages as they might be able to obtain. Wherever these pernicious and unlawful organizations have been destroyed, or ceased from active interference with the rights of others, a marked improvement has followed, both in the condition of the workmen and the mining interest in general; it being observable that where this intermeddling has been persisted in, the reverse has been true. Thus the Amador mine, where the plan of paying discriminating wages is adopted, and no dictation from outsiders is tolerated, is notoriously one of the most prosperous in the State, the hands employed being also noted for their contentment and thrift, while the Eureka mine at Grass Valley, naturally a much more productive property than the Amador, but where the demands of these leagues have been always acceded to, and even encouraged, has proved far less remunerative to the owners, who have not at the same time escaped all trouble with workmen, the Company having been forced within the last few days to temporarily suspend operations in order to root out the "specimen thieves" from their force, so prevalent had this practice of pilfering become. But, as before remarked, these leagues have generally refrained from acts of extreme violence of late, having in many places disbanded altogether, nor is it likely that they will ever again become formidable to the interests of capital and free, untrameled labor. In their partial disruption our industrial system has been to that extent relieved of a hurtful and disturbing element, which it is to be hoped will never again be reinstated with its brutal invasion of private rights and its outrageous exactions. The year we are considering has enjoyed a greater freedom from

UNHEALTHY EXCITEMENTS

than almost any other in the history of the State. We have had an absolute exemption from anything like a stampede, though a limited migration has been stimulated to several distant points, such as the San Diego and the Burro mines early in the year, and to Snake river at a later period. These movements were restricted, however, to a comparatively small number, nothing having occurred like the insane crusades that have heretofore so often happened in California, whereby populous camps were suddenly emptied and entire communities floated off on the tidal wave of a wild excitement. Satisfied after many trials of the impolicy of rushing hastily off to remote and inhospitable regions, our mining population are becoming less and less nomadic every year, experience having taught them that few places combine so many advantages for the prosecution of their calling as California.

OUR POSITIVE GAINS.

Besides so much of a negative and corrective kind, we have introduced many valuable helps and made much positive progress in mining the past year. Never before have the times been so prolific of valuable improvements and inventions, both metallurgical and mechanical. Prominent among these are the Stetefeldt Fur-

nace—meeting more nearly an important want than has ever before been done—several machine drills, that are likely to prove of the utmost service, and improved nozzles, insuring greater safety and efficiency in the application of water in hydraulic washing, besides a great variety of other devices of the highest utility, either as labor-saving agents or as aids in securing an increased per centage of the precious metals. The Central Pacific Railroad, through its tendency to facilitate communication and cheapen freights to and from the distant interior, has given a rapid expansion to mining in an extensive region that would otherwise have remained slow of development. Many thousand tons of ore and crude bullion have been shipped to this city and other remunerative markets over the railroad, that would not have borne carriage by the old methods of transportation.

Extensive smelting works, strictly first-class in their conduct and appointments, have been erected here, and are now undergoing enlargement, to insure ample capacity for handling all the lead, bullion and ores of this class that may arrive here for treatment. Already the quantity of this material manipulated at these works is said to exceed that passing through any other establishment of the kind on the continent. After supplying all home requirements, some six or eight hundred tons of lead are now being shipped to New York monthly, and the yearly values produced at these works, already large, will soon amount to millions of dollars. We have also in this city mills for crushing and sampling ores, preparatory to offering them on the market, affording the miner a ready means for ascertaining their exact value before disposing of them. With these advantages, and the lessened cost of freights to this point, as compared with charges to the Atlantic seaboard, the mineral products of Utah and Nevada may be expected to find their principal market here.

Within the past twelve months the number of

SMELTING FURNACES IN THE MINING DISTRICTS

has been greatly multiplied, there being, perhaps, twice as many now as there were one year ago. Some of these structures are rude and of small dimensions, yet they serve a two-fold purpose—schooling the owners thoroughly in the difficult business of smelting, while they supply them with the means for prospecting and opening up their mines. In this manner a numerous population is being trained up, who will shortly possess all the practical skill as well as the means for conducting every department of this business with success. Many of these furnaces are of considerable capacity, and quite perfect in their arrangements, turning out from ten to twelve tons of crude bullion per day. They have not yet found it profitable to attempt parting and refining their bullion at these works, for which reason the most of this material from all parts of the Pacific coast finds its way to the works in this city for treatment, the miners generally having ascertained, after numerous experiments, that they can dispose of these commodities to better advantage here than at Newark or elsewhere in the East.

Viewed in the light of the late rapid expansion, and the great abundance of these ores everywhere found, this smelting business promises soon to become one of the most largely productive and profitable branches of mining on the coast. The deposits of argentiferous galena and other silver-bearing lead ores surpass in extent all others in the country, and perhaps elsewhere in the world, large areas abounding with these minerals in California, Nevada, Utah and Arizona, the mines of this class recently found near Salt Lake being especially valuable. Owing to the facility with which these ores can generally be obtained, and the readiness wherewith they can afterwards be disposed of, either by smelting on the ground or through transportation and sale elsewhere, this branch of mining must become popular with the masses, more especially with men of limited capital.

PROBABLE PRODUCTS OF BULLION FOR THE YEAR UNDER REVIEW.

With so many gains achieved, so many abuses partially corrected, and so much substantial progress made, it is believed that we shall be able to show as large an aggregate product of bullion on this coast for the past as for any recent preceding year. The yield of the Washoe and Grass Valley mines, and other leading centres of supply, has about equalled, and in some cases exceeded, the average, while a great many new tributaries have been added to former sources of production. Thus, we have the Meadow Valley mine, in the Ely district, turning out steadily from $110,000 to $150,000 per month; the Eureka Consolidated Company, running from their furnaces an average of ten tons of crude bullion per day, worth in San Francisco about $350 per day, a late consignment, comprising three car-loads, having yielded at the Selby works $370 per ton, silver and lead. In this category may be included the smaller gains derived from mills and furnaces lately erected in many other localities, such as the Cope, Bull Run, Mineral Hill, Railroad, and various other districts in Utah and Nevada, chief of which are the mines in the neighborhood of Salt Lake. From many of the earlier settled districts, too, where mills were put up several years ago, but had been prevented, by a variety of causes, from accomplishing much, a largely increased yield has been sent forward the past year. Prominent in this rank we have the Humboldt and Reese river countries, the Cortez, Silver Bend and Pahranagat districts; the resumption, after a long suspension, of active and profitable operations at the Auburn mill, with a steady production at Pine Grove and Silver Peak, and some slight amendment in Esmeralda, and several other old, and for a long time declining, camps in the State of Nevada. Of the numerous companies operating on the Comstock lode, several have been well prospered the past year, there being much improvement in the aspect of these mines and the general condition of affairs connected with many of them. The product of the Comstock lode, including mines in the immediate vicinity, will probably prove to have been as large for the year under review as for either of the two preceding years, a yield that it is believed can be kept up, and perhaps further augmented, for an indefinite period in the future. Recurring to

CALIFORNIA,

we find that here also, either through late discoveries or recent improvements in the older districts, we have some auxiliaries to report to our producing forces. Of the former class are the San Diego mines, and the still more important discoveries made not long since in the Clarke and Yellow Pine districts, in the southeasterly part of the State, and which, in view of the probability of their being put in easy and early railroad communication with San Fransisco, may be pronounced of large prospective value. Already considerable quantities of ore, rich in gold, silver and copper, have arrived here from these mines, coming by the circuitous but inexpensive route of the Colorado river and the Gulf of California. Among mines of earlier location, we have a creditable progress to note in the Trans-Sierra counties of Inyo, Mono and Alpine; the Dunderberg lode, in the easterly slope of the range in Mono, having within the past year been developed into a largely productive and paying property. The vein mining throughout the State generally has been more active and prosperous than for some time before, the same remark applying with less force to placer operations, these latter having been much retarded in many places through a scarcity of water the past season, a result due to an unusually light fall of snow on the mountains the preceding winter.

In the other Pacific States and Territories about the same sort of experience was met with in the several departments of this industry as in California, the bullion product throughout having aggregated about the average yield of the past few years.

Michigan.

We are enabled to give this week the total amount of refined copper and mineral shipped from the port of Portage Lake during the season of 1870. The figures show the business done from the 1st of December, 1869, to the 31st of November, 1870, inclusive. The shipments of copper from the Hecla Calumet, for the year above ending, are largely in excess of the previous year, and must impress every one with the wonderful and steady yield of the conglomerate. A portion of the mineral from these mines was smelted at Detroit, so that we cannot give the total yield of ingot copper for the year just at present. The operations for the past year at the Quincy mine must be highly satisfactory to the stockholders. The figures for this year show a slight excess in yield over last. This company has all its mineral smelted in Detroit, consequently it will be some time before we can get the figures on the total amount of refined copper produced for the year. The great "illegitimates" and twin unfortunates, the Franklin-Pewabic, show a great falling-off in their products as compared with those of last year. The mines are capable of better things, if they were only in the hands of proper managers. Had Mr. WILLIAM WEBB been allowed to carry on his plan of working the Franklin-Pewabic, as inaugurated by him just before he was set aside to make room for the Boston "ring" crowd, both mines to-day would be in a very nice position. The shipments of copper for the past year from Keweenaw Point are not all in. The only figures we can give are those from the Phœnix and Cliff. The Phœnix has increased its yield materially over last year, and the prospects for a still greater increase the coming year is said to be good. The figures of the Cliff show the yield of that mine for seven months only, the mine having suspended operations on the 1st of last July. Since the cessation of operations underground, the company have obtained 36 tons 901 pounds of mineral from their old burrow piles.

Mineral shipped from the port of Eagle River:

	Tons.	Pounds.
Phœnix	758	251
Cliff	485	163
Total	1,243	414

We expected to be able to give the shipments from the port of Ontonagon this week, but a telegraphic request for the same was answered by informing us that some of the agents of the mines in that district had conscientious scruples about furnishing the yield of their mines. Next week we hope to be able to give about the production of copper in the Ontonagon district for the present year. The only mine we have heard from in that district is the National, the total product of which, for the year 1870, was 160 tons 1,000 pounds. The yield of the National for the month of November was 30 tons. In Keweenaw county, we have yet to hear from the Central, Copper Falls and Amygdaloid, and from what data we have on hand, we estimate that the grand total production of ingot copper for the year past, from the copper mines of Lake Superior, will not be far from 12,000 tons.

Refined Copper and Mineral shipped in 1870 from Portage Lake:

Hecla Mining Company	2,446,755	6,822,176
Calumet Mining Company	1,198,235	4,080,413
Quincy Mining Company	2,952,742	.....
Schoolcraft Mining Company	15,467	384,290
Pewabic Mining Company	.....	446,006
Franklin Mining Company	.....	912,460
†John Uren	.....	504,200
South Pewabic Copper Company	.....	873,272
R. Shelden, trustee	.....	177,302
Huron Copper Mining Company	.....	433,556
*Daniel Dunn	.....	33,400
Hancock Mining Company	.....	156,600
Grand Portage Copper Company	.....	2,647
*Daniel Northey & Co	.....	33,200
*Philip Tucker	2,076	10,564
*Jeseph Jenkins	.....	5,613
Union Steamboat Company	.....	993
*Edward Champion	.....	10,911
*J. H. Pierce & Co	.....	8,977
*William Hitchings	.....	1,844
*Williams & Gottstein	.....	3,252
*Davy & Matthews	.....	3,921
Huron Mine, from Tributers	.....	5,245
South Pewabic, from Tributers	.....	2,661
Totals	6,615,275	14,913,502

Total shipments, 21,528,777 ponnds, or 10,764,777-12,000 tons.—*Chicago Commercial Reporter.*

†Tributer Franklin, Pewabic. *Tributers.

Utah.

THE SILVER MINES.

"CAPTAIN WILLIAM LIGHT, a miner of large experience and a citizen of this place," says the Georgetown (Col.) *Miner*, "not long since visited the Territory of Utah, for the purpose of examining the silver mines of Mormondom. Since the return of CAPTAIN LIGHT, he has kindly furnished us with the following interesting particulars: On Horn Silver mountain, East Cañon district, fifty-five miles west of Salt Lake City, are the Tampico and other silver lodes. The vein material of the lodes is quartzite, calc spar and chlorides. The country rock is limestone. Small pockets of very rich ore are found in the Tampico, the dressed ore yielding as high as $5,000, coin, per ton. The second grade is worth $600, and the third grade $200 per ton. The lodes on Base Metal mountain, lying contiguous to Horn Silver mountain, contain argentiferous galena and carbonates of lead, containing about fifty per cent. lead and $50 per ton in silver. Bingham district is situated about twenty-five miles west of Salt Lake City. In Bingham gulch sluicing for gold is accompanied with good results. The gold is coarse in size and of fine quality. There are several gold lodes here, upon which a large amount of mining has been done. In this district a California company is putting up large smelting works. The silver mines here are large and the pay vein material principally argentiferous galena containing about $40 per ton in silver, and fifty per cent. lead. The country rock is conglomerate, porphyry and trap.

"Captain LIGHT speaks of Little Cottonwood, which is twenty-five miles southwest of Salt Lake City, in terms of high praise. It is in this district that the famous Emma lode is situated. The country rock is limestone, and the veins seem to be quite permanent. The ores of the Emma, and of the district, are galena and carbonates of lead, and carry about $200 per ton in silver, and from 40 to 50 per cent. of lead. There is a good farming country in this district, and but for one mile around the Emma has been prospected. The ores from this district are hauled to Salt Lake City, where they are crushed, sampled and sold.

"Mountain Meadow is another district in Utah that seems to be flourishing. RAYMOND & Co. erected a mill there in 1870, and commenced working in September, 1870. Their mill contains fifteen stamps, and the ore treated is chlorides. The first eight days' run of the mill yielded over $35,000, since which time the weekly shipments of bullion from this mill are from $15,000 to $20,000. These figures are reliable, being obtained from the books of WARREN HUSSEY, banker at Salt Lake City.

We take the following from the Salt Lake *Tribune*: "Messrs. HASTINGS, EDDY, MATTHEWS and WEDGE, gentlemen from Fond du Lac and Lake Superior, have undertaken to develop the 'Tintic lode" in East Tintic. It is purposed to strip the hill to find the best point for sinking. It must be satisfactory to the mining interests of this district, the fact of men of large experience in mining business proving themselves willing to assist in its development, either in working claims or by erecting furnaces. These gentlemen purpose the erection of furnaces, providing the miners of Tintic will extend to them sufficient encouragement, and, if milling ore should be found in sufficient quantitities, they will speedily have a mill erected. The condition of this district presents the same feature with the majority of the mining camps of Utah, viz.: the lack of capital for the successful development of claims. The majority of the leads having been discovered by poor men, who, in order to be enabled to hold them, have used up the summer and fall season in working assessments, without any very solid returns. We are of opinion that it would be far more advantageous to the owners of claims to seek the assistence of capital in their enterprises, and whenever opportunities may present that will ensure the working of one or more ledges, to take advantage of circumstances—so long as they themselves are safe—to prove the value of what they possess. Shafts are not sunk, hills stripped, machinery purchased, or labor performed without the outlay of a large amount of means. The experience of the various mining districts of Utah is, that silver deposits exist in a vast number of ledges, clearly defined. These ledges require but the steady perseverance which old miners throughout the States have been wont to give, to their proper and successful development. With but few exceptions the mines are undeveloped; while such as are, and in working condition, have already made very handsome returns to their owners, with a certainty of continuation. Such mines, whoever may have been the original prospectors, have found it necessary to solicit the assistance of capital to aid them in realizing such a consummation. Of the value of the mineral resources of Utah sufficient evidence has already been given. That the field for operating is very extensive, geologists of the American and European school have been witness; while men of capital, East and West, have invested, and are prepared to invest, in the solution of their value. Under circumstances so favorable, with the inclination to develop the gold and silver resources of the Territory that many have who possess the means, it will undoubtedly be to the advantage of the holders of the leads to work them to a successful termination. Mining, like any other business, needs sufficient capital to ensure its success. With but small capital, and that in the shape of labor, the probable chance of success, commensurate with the great outlay, is remote. To suppose a case: Any man may own twenty claims, on as many different ledges, and, being desirous of holding each and all of them, he *must* work on each ledge in succession, and by the time he has done work sufficient to hold them, even in the most favored district, he is necessitated to commence with the first again, hence, making continuous work without any specific results or determination of value. Supposing such parties could dispose of their interest in nineteen ledges, and retain one, the proceeds of the sales would enable them to develop the one they owned, thereby turning their labor labor to individual as well as general account, and be productive of the benefit sought. We admit this may enrich others, but the individaal himself has ample cause to be satisfied with his enterprise.

Wyoming.

IRON MOUNTAINS.

A Laramie (Wyoming Territory) correspondent of the St. Louis *Journal of Commerce* writes: "But more wonderful and interesting than anything else in this region is the mountain of iron, which lifts its black sides above the surrounding country a few miles to the northeast of Laramie. We cannot better give your readers an idea of this wonderful deposit than by transcribing a portion of the report of Judge KINGMAN, of the Supreme Court, who, in company with Mr. AMES, made a careful survey of this locality last September. He says: 'The Black Hills are a long ridge of land running nearly north and south, about two thousand feet high, generally buite flat on the top, with long, sloping sides. It is about twenty miles wide on the top, making a long, broad plateau, broken here and there by peaks and ridges that rise above the general level, and intersected by gorges and valleys that sink below it. We crossed this plateau from the west to the east side, and recrossed it five or six miles further south. The iron mountain is on the east side, near where the gorge or canyon of the Chug water cuts through the crest of the plateau. It is an isolated peak or cliff, a mile long by several hundred feet wide, rising almost perpendicularly on the west side, and covered somewhat with earth and drift on the east. The ore is stratified, and is entirely free from rock or earth of any kind. The blocks are black, smooth, heavy, sharp, edged and crystalline, and break with a fracture almost like cast iron. The peak rises several hundred feet, some say two thousand feet, above the general surface. Such is Iron Mountain. But all the way across the plateau are peaks of iron cropping out in every direction. They are by no means so largely exposed, because the erasion around them is not so great; but they are parts, doubtless, of the same great deposit. There is more pure magnetic ore in the Black Hills of Wyoming Territory, above ground, than all the teams of North America can haul away in a life-time.'

"Situated in the midst of such coal and iron fields as these, surrounded by fertile plains, capable of producing the food for a dense population, with inexhaustible quantities of timber only a few miles away, and with the celebrated 'Last Chance' and 'Douglas Creek' gold mines, and the 'North Park' placer diggings, all tributary to her as a base of supplies, we think Laramie City may be pardoned for exulting somewhat upon the natural advantages of her location, and for professing an unwavering faith in her steady growth and prosperous future."

MARKET REVIEW.

The Coal Trade.

NEW YORK, Jan. 20, 1871.

WHOLESALE.—Our news from the coal regions, regarding the strike, are very meagre. No overtures have been made by either the men or operators, and, indeed, we learn there is no idea of any being made. As is usual with all workingmen after many months of hard labor, they desire rest for a few weeks, and will not consider anything during that time. When some of them begin to be in want of the necessaries of life and call upon the Treasury of the Miners' Association for help, then they will begin to consider the true situation of affairs. For reasons given last week, it seems to us that this will be a very protracted strike, and much suffering will be caused by it.

Coal is advancing rapidly in this market, not so much from the lack of supply just at the present time, but from a desire by those who have coal to realize the most possible upon it, not knowing when they will be able to procure more. The market is taking just the course that we pointed out to our readers that it would take, though really there is very little coal being disposed of to retailers and consumers. To keep business lively in Trinity Building one dealer, less sanguine than another, will dispose of his coal to his neighbor, and next week (unknowingly, perhaps) buy it back through some other party at an advance; thus there is the appearance of much trade doing, while in reality the coal has not been moved from the dock or the car. Those retailers who have customers ready to take their coal at the advance asked, as well as sugar-houses, manufacturers, and steamers, who must be supplied or stop, also buy an occasional cargo.

The rates we find current in the market to-day are $6 50 to $7 00 for Steamer Broken and Egg, $7 50 to $8 00 for ½ either of the above and ⅔ Stove, and $8 50 for Stove alone. These prices will no doubt appear to our readers to be exorbitant, but, at the same time, we think the state of affairs fully warrants them. We feel very loth to advise dealers to buy at these prices, feeling that they should have taken our advice long ago when the trouble first began, and even while in embryo. The only thing that we can see that they can safely do, is to sell the coal first and buy afterwards. We learned of one lot of twelve cars of Lump Coal which was sold to-day at Hoboken in the cars for $7 50 and back freight to Paterson, which is 90c. more. We believe this statement, as it came from good authority; and we understand that the dealers at Paterson have been particularly unfortunate in getting a supply of coal, and the yards are quite empty. This no doubt is the case in many instances, and probably is more particularly the fact among those who do not subscribe to or buy some good coal organ that would keep them posted in their business. Serves them right for being "penny wise and pound foolish."

RETAIL.—The retail trade is not over brisk, notwithstanding high prices stare the consumer in the face. From the teachings and ravings of the daily papers, they are led to believe this, and all strikes are shame, and yet hold the impression that coal will be lower. Good coal can yet be bought at $6 50 to $7 50 delivered.

FREIGHTS.—There is so little offering that quotations are hardly necessary. Harbor freights are firm. Amboy, 60c.; Hoboken, 40 to 45 cts.

Anthracite Coal Trade for 1870 and 1871.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending Jan. 14, 1871, compared with week ending Jan. 15, 1870.

COMPANIES.	1870. WEEK.	1870. TOTAL.	1871. WEEK.	1871. TOTAL.
*Phila & Reading R.R.	20,989	272,182	26,445	507,104
†Schuylkill Canal	....	34,373	....	36,225
Lehigh Valley R. R.	43,517	308,337	21,109	330,117
Lehigh & Sus. R. R.	17,797	32,812	20,368	52,126
†Lehigh Canal	....	....	....	....
Scranton North	12 198	25,172	....	....
" South	29 47:	54,327	....	....
Penn. Coal Co., rail	20,445	32,513	954	1,572
" " canal	....	....	....	....
Del. & Hud. Canal Co.	12,550	21,934	10,457	21,457
" " East	1,484	3,711	3,054	6,128
" " West	2,118	3,115	....	....
South	....	....	....	....
Shamokin	6,979	11,181	9,637	16,100
Trevorton	318	816	....	....
Lykens Valley Coal Co.	900	1,500	....	....
Wyoming South	....	....	....	....
Wyoming North	....	....	....	....
P. N. Y. C. & R. R. Co.	3,817	21,027	2,256	31,344
Williamstown, Col'y	4,165	7,776	....	....
Short Mountain	....	....	....	....
Total	170,632	831,771	94,281	1,002 173
1870	94,231			831,771
Increase week and year	82,351			170,402

* Less coal transported for Company's use and Bituminous coal.
†Closed for the season.

Bituminous Coal Trade, 1870 and 1871.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending Jan. 14, 1871, compared with week ending Jan. 15, 1870.

COMPANIES.	1870. Week.	1870. Year.	1871. Week.	1871. Year.
B. & O. R. R.	2,544	4,203	13,697	29,148
C. & O. Canal	....	....	....	....
H. & B. T. R. R.	1,985	6,165	4,290	7,629
Harrisburg & D.	5,367	46,464	5,842	19,480
L. V. R. R.	....	1,743	....	1,616
P. & N.Y. C. & R. Co.	2,931	21,969	3,972	25,770
	12,827	80,544	27,801	83,643
			12,827	80,544
Increase			14,974	3,099

Pennsylvania Coal Company,

Shipments of Pittston Coal for the week ending January 14, 1871.

	1871. WEEK.	1871. YEAR.	1870. WEEK.	1870. YEAR.
By Railway	954 05	1,572 01	20,445 10	32,513 18
" Canal	....	....	....	....
Total	954 05	1,572 01	20,445 10	32,513 18
Decrease 1871, 30,941 17 tons.				

Penn. and N. Y. Canal and Railroad Co.

REPORT of Coal Transported via. the Pennsylvania and New York Canal and Railroad Company, for week ending January 14, 1871:

	WEEK.	LAST YEAR	INCREASE.	TOTAL.
Anthracite	2,256 01	3,817 18	1,561 14	31,344 01
Bituminous	3,972 00	2,931 00	1,041 00	25,770 00
Total	6,228 01	6,748 18	2,602 14	57,114 10

This decline in anthracite is owing to strikes among the miners in the Wyoming Valley.

Report of Coal Transported over Lehigh Valley Railroad

Three days ending January 14, 1870, and previously this season, compared with same time last year:

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL. Tons. Cwt.
Total Wyoming	5,282 11	62,414 09
" Hazleton	13,215 03	204,723 07
" Upper Lehigh	39 16	442 03
" Beaver Meadow	4,207 00	65,470 10
" Mahanoy	3,154 15	50,344 04
" Mauch Chunk	11 06	910 19
Total Anthracite	25,910 11	384,306 15
Bituminous Coal from all sources		1,615 00
Total by rail and canal	25,910 11	385,920 15
Same time last year	46,634 01	340,889 01
Increase		45,031 14
Decrease	22,723 10	
Forwarded East from M'h Chunk by rail	21,109 02	330,117 15
Same time last year	43,517 14	308,337 07
Increase		21,780 08
Decrease	22,408 12	

RECAPITULATION.

Forwarded East from M'h Chunk by rail	21,109 02	330,117 15
To N. C. R. R., at Mount Carmel	19 00	19 00
Forwarded North from L. & B. Junction	2,256 04	31,334 05
To L. & S. R. R. at Packerton for rail	97 03	1,837 02
Delivered at M'h Chunk	11 01	306 13
Delivered on line of road above Mauch Chunk	628 15	2,408 08
Delivered above M. Chunk for use of L. V. R. R.	1,890 06	8,697 01
To L. & S. R. R., at P'n Har., for railroad		94 10
Do. for canal		7,060 19
At M. Chunk for canal		2,431 02
Total Anthracite	25,910 11	384,306 15
Bituminous Coal		1,615 00
Total all kinds	25,910 11	385,920 15

Report of Coal Transported by the Lehigh Coal and Nav. Co.'s Railroads and Canals,

Week ending January 14, 1871—Compared with same time last year.

WHERE SHIPPED FROM	WEEK, 1871. tons ct	WEEK, 1870. tons ct	YEAR, 1871 tons cwt.	YEAR, 1870. tons cwt.
Wyoming Region	14756 12	12008 08	35820 14	20384 09
Upper Lehigh Region	1544 07	558 04	4614 06	811 10
Mahanoy Region	189 10	93 04	698 17	243 01
Hazleton Region				
Beaver Meadow Region				
Treskow Region	432 05		1043 03	
Mauch Chunk Region	5270 04	6020 12	13475 04	12206 02
Totals	22192 18	18685 08	55452 04	34144 02
Increase	3507 10		21308 02	
Decrease				
DISTRIBUTION.				
Forwarded East of Mch Chunk by Rail	20368 10	17797 01	52126 03	32812 17
Forwarded East of Mch Chunk by Canal				
Delivered at and above Mauch Chunk	1824 08	715 07	3326 01	1148 18
Delivered to L. & B. R. R. at Plymouth Bridge		173 00		182 07
L. V. R. R. at Sugar N.				
Totals	22192 18	18685 08	55452 04	34144 02
Of the above there was transported on acc'nt of L. C. & N. Co.	6336 00	7204 11	14711 11	13849 10
W.-B. C. & I. Co.	11456 18	6030 05	23912 11	10693 13
Totals	17794 18	13234 16	41654 02	24512 03
Increase	4560 02		29111 19	
Decrease				

Shipments of Cumberland Coal

for the week ending Saturday, January 7, and for the year 1870:

SHIPPED BY	B. & O. R. R.	C. & O. CANAL.	TOTAL.
Cooke M	....	.....	....
Borden	401 08	.....	401 08
Consolidation	2,875 06	.....	2,575 06
Spruce Hill	464 01	.....	464 01
Midlothian	370 16	.....	370 15
H. and Baltimore	75 05	.....	75 05
do Va M	959 04	.....	959 04
V C & I Co	952 07	.....	952 07
G. C. C. and I.	659 19	.....	659 19
Maryland	643 18	.....	643 18
American	1,695 05	.....	1,695 06
Atlantic	581 00	.....	581 00
Piedmont	777 15	.....	777 15
Swanton	362 05	.....	362 05
Barton	720 00	.....	720 00
Potomac	1,045 15	.....	1,045 15
Franklin	857 04	.....	857 04
George's Creek M. C.	293 01	.....	293 01
Big Vein	525 18	.....	525 18
Total week	13,697 07	.....	13,697 07
Previous	15,450 71	.....	15,450 17
Total year	29,148 04	.....	29,484 01

Statement of coal transported over the Cumberland and Pennsylvania Railroad during the week ending Saturday, Jan. 7, and during the year 1871, compared with the corresponding period of 1870:

WEEK.

YEAR.	C. & O. CANAL. Tons. Cwt.	B. & O. R. R. Cwt.	TOTAL. Tons. Cwt.
1871		596 08	596 08
1870		1,507 07	1,507 07
Increase			
Decrease		910 19	910 19

YEAR.

YEAR.	C. & O. CANAL.	B. & O. R. R.	TOTAL.
1871		955 07	955 07
1871		2,601 01	2,601 01
Increase			
Decrease		1,645 14	1,645 14

Philadelphia and Reading R. R.

Amount of coal transported on the Philadelphia and Reading Railroad, Saturday, Jan. 14 1871;

From St. Clair	10,689 18
" Port Carbon	1,564 00
" Pottsville	597 16
" Schuylkill Haven	9,051 1
" Auburn	1,133 03
" Port Clinton	2,837 03
" Allentown and Alburtis	661 01
" Harrisburg and Dauphin	5,911 06
Total paying freight	32,446 04
Coal for Company's use	1,688 11
Total for week	34,134 15
Previously this year	417,900 10
Total	452,035 05
To same time last year	349,152 06

Delaware and Hudson Canal Company.

The following is a statement of coal transported by the Delaware and Hudson Canal Company, for the week ending January 14, 1870.

	WEEK.	SEASON.
By Del. and Hud. Canal	....	21,457 00
By Railroad East	10,457 00	6,128 00
West	3,054 00	
South	....	....
Total	13,511 00	27,585 00
Corresponding time in 1870.	— —	— —
By Del. and Hud. Canal	— —	— —
By Railroad East	12,550 00	21,934 00
West	1,484 00	3,711 00
South	2,118 00	3,115 00
Total	16,152 00	28,760 00
Increase	....	....

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

	AT NEW YORK, January 20. R. A.	W. A.	AT PHILADELPHIA. January 21. R. A.	W. A.
SCHUYLKILL.				
Lump	$— —	$— —	— —	— —
Steamer	— —	— —	— —	— —
Broken	— —	— —	— —	— to —
Egg	— — to —	— — to —	— —	— to —
Stove	— to —	— —	— —	— to —
Chestnut	— to —	— —	— —	— to —
Pea	— —	— —	— —	— —
LEHIGH.				
Lump, (along side)	— —	— —	— —	— —
Broken	— —	— —	— —	— —
Egg	— —	— —	— —	— —
Stove	— —	— —	— —	— —
Chestnut	— —	— —	— —	— —
Pea	— —	— —	— —	— —
SPECIAL COALS.*				
Diamond Vein	R. A. 6 00	— —	— —	— —
New England	" — —	— —	— —	— —
Locust Dale	W. A. 5 50	— —	— —	— —
Honey Brook, Le'h W'g	A. 6 00 to 6 50		— —	— —
Spring Mountain	" 6 00 to 6 50		— —	— —
Sugar Creek	" " 6 00 to 6 50		— —	— —
Sugar Loaf	" " 6 00 to 6 50		— —	— —
Old Comp'y's	" " 6 00 to 6 50		— —	— —
Cross Creek	" " 6 00 to 6 50		— —	— —
Room Run	" " — —		— —	— —
Girardville	" " — —		4 75	— —
McMichael	" " — —		4 75	— —
Shamokin	" " 5 50		5 25	— —
Lykens Valley	" " — —		5 75	— —
Broad Top	" " 5 50		— —	— —
Hill & Harris	" " — —		4 75	— —
Henry Clay	" " — —		5 00	— —
Powelton	" " 5 50		— —	4 75

(*Dealers in these coals may be found in our advertising columns.)

Company Coals.

January, 1871.
No quotations during strike.

	L.	Str.	Gra.	Bg.	Sto.	Ches
Scranton at E. Port	— —	— —	— —	— —	— —	— —
Pittston at Weehawken	— —	— —	— —	— —	— —	— —
Lackawana at do	— —	— —	— —	— —	— —	— —
Wilk'b're at Hoboken	— —	— —	— —	— —	— —	— —
Old Co. Lehigh at Pt. Johnston	— —	— —	— —	— —	— —	— —
Lehigh at E. Port	— —	— —	— —	— —	— —	— —

For freights to different points, see "Freights."

Prices for Coal at Mauch Chunk.

January 1871.

	F.L.	Bro.	Gra.	Eg.	Sto.	Chest.
Lehigh	$3 00	$3 75	$3 75	$3 75	$4 00	$3 00
Wilkesbarre	3 00	3 75	3 75	3 75	4 00	3 00

For freight to Elizabethport and to New York see "Freights."

BITUMINOUS COALS.

Kingston Coal Co.'s Phœnix Vein, f.o.b. at Phila.		$5 00
Lemon " "	"	4 75
Cumberland Vein Coal		4 75
Consolidation Coal Co.'s on board	N. Y.	7 00
Maryland Coal Co.	"	7 00

Prices at Baltimore—January, 1871.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$5 80@— —
Pittston and Plymouth, do	5 60@5 75
Shamokin Red or White Ash, do	— —@6 00
Lykens Valley Red Ash, do	6 25@— —
Zerba Valley	6 25@— —
Trevorton	6 00@— —
By retail, all kinds per ton of 2240 lbs.	7 25@8 25
Georges Creek & Cumberland f. o. b. at Locust Point for cargoes	4 60@4 75
Fairmont and Clarksburg gas, f. o. b. at L. Point	6 00@6 50

Prices at Georget'n, D.C., & Alexandria, Va.

January, 1871.

George's Creek and Cumberland f. o. b. for shipping..$4 40

Prices at Havre de Grace, Md.

Wilkesbarre and other White Ash for cargoes	$— —@5 50
Lykens Valley	— —@6 25
Shamokin Red or White Ash	— —@5 75
Trevorton and Zerba Valley	— —@6 00

Prices of Gas Coals.

January, 1871.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr. 41-43 Pine st., N.Y.

Duty, $1 25, gold.	Coarse.	Slack.
Block House	$1 75	@— 75
Gowrie	1 75	@— 75

Corrected by Bird, Perkins & Job, 86 South street.

	Coarse.	Culm of Coal.
Pictou	$2 25	@1 25
Sydney	2 25	@— 80
Lingan	1 75	@— 80
Little Glace Bay	1 75	@1 00
Caledonia	1 60	@— 80

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty $1 25 per ton, gold, on the coarse coal. 25 per cent. ad valorem on the Culm of Coal.

AMERICAN.

	Currency.
Westmoreland	7 75 @8 00
Fairmount Gas Coal Co. of N. Y.	7 50 @— —
Despard Coal Co	$7 50 @— —
Penn	7 75 @8 00
Newburg Orrel Gas	— — @— —
West Fairmount Gs Caoal	8 00 @— —

AT PHILADELPHIA.

Powelton	$7 80

Prices of Foreign Coals.

January, 1871.

Duty $1 25 per ton.

Corrected weekly by PARMELE BROS., No 32 Pine street New York.

Liverpool Gas Caking	$ 9 00@— —
" Cannel	11 50@12 50
" House	— —@16 00
" " Orrel	12 00@14 00

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$16 00@17 50
" " Cannel, "	18 00@20 00

Per ton 2,000 lbs. delivered.

Foreign and Provincial Freights.

January, 1871.
Closed for the winter.

Foreign.

Newcastle and Ports on Tyne, per keel of 21 1-5 tons..... £14 00@£16 00
Liverpool, 5 per cent primage..... 13s @16. ton

TO NEW YORK.

Provincial

Sidney	$ —
Lingan	—
Cow Bay	—
Port Caledonia	—
Little Glace Bay	—

TO BOSTON.

Sydney	$ —
Lingan	—
Cow Bay	—
Port Caledonia	—
Little Glace Bay	—

Rates of Transportation to Tide Water.

Closed for the Season.
BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Port Carbon..... $2 00
Less drawback of 50 cents on all Coal shipped east of New Brunswick and south of Cape Henry.

MAUCH CHUNK TO ELIZABETHPORT.

L. V. Railroad fr.m Mauch Chunk to Easton	$ 84
C. R. R., N. J., Easton to Elizabethport	1 21
Shipping expenses at Elizabethport	25
Warfage	10
Total	$2 40

MAUCH CHUNK TO PORT JOHNSON.

L. V. R. R., or L. & S. R. R. from M. C. to Easton	$ 84
C. R. R., of N. J., Easton to Pt. Johnson	1 24
Shipping expenses	25
Warfage	10
Total	$2 43

TO HOBOKEN.

L. V. R. R., Mauch Chunk to Easton	$ 84
Morris & Essex R. R. Easton to Hoboken	1 36
Shipping expenses	25
Warfage	10
Total	$2 55

TO SOUTH AMBOY.

L. V. R. R.	84
B. & D. R. R. / Cam. & Am. R. R. }	1 14
Shipping Expenses	25
Total	$2 23

PENN HAVEN TO ELIZABETHPORT.

L. V. RR. Penn Haven to Easton	84
C. RR. of N. J., Easton to Elizabethport	1 21
Shipping expenses	25
Wharfage	10
Total	$2 40

Freights.—January, 1871.

TO EASTERN PORTS.	From Philadel'a.	From E. Port and Port Johnson.	From Newburg.	From Rondout.
Amesbury	$2 50	$2 00		
Bangor	2 30	1 60		
Bath	2 30	1 75		
Boston	2 10	1 85		
Bridgeport	1 75	1 00		
Bristol	2 00	1 40		
Cambridgeport	2 75	2 00		
Derby	2 00	1 20		
Dighton	2 30	— —		
East Cambridge	2 35	2 00		
Fall River	2 00	1 40		
Hackensack	1 75	1 00		
Hartford	2 50	1 60		
Jersey City	1 40	60		
Middletown	2 25	1 25		
Mystic	— —	1 25		
New Bedford	2 00	1 40		
Newburyport	2 35	1 85		
New Haven	1 90	1 00		
New London	1 76	1 25		
Newport	2 00	1 40		
New York	1 35	60		
Norwalk	1 80	1 00		
Norwich	2 00	1 30		
Pawtucket	2 30	1 50		
Portland	2 30	1 50		
Portsmouth, N. H.	1 45	1 85		
Providence	2 00	1 25		
Rockport	2 10	1 65		
Saco	2 25	1 75		
Sag Harbor	1 70	1 20		
Salem	2 35	1 65		
Stamford	2 00	1 00		
Stonington	2 00	1 30		
Taunton	2 30	1 75		
Warren	— —	1 40		
Washington	1 25			
TO RIVER PORTS.				
Albany				
Catskill				
Cockaackie				
Cosyman's				
Cold Spring				
Fishkill				
Haverstraw				
Hudson				
New York				
Nyack				
Poughkeepsie				
Rhinebeck				
Rondout				
Saugerties				
Sing Sing				
Stuyvesant				
Tarrytown				
Troy				
West Point				
Yonkers				

METALS.

NEW YORK, January 19, 1871.

IRON.—Duty: Bars, 1 to 1½ cents ℔ lb; Railroad, 70 cents ℔ 100 lbs.; Boiler and Plate, 1¼ cents ℔ lb; Sheet, Band, Hoop, and Scroll, 1¼ to 1¾ cents ℔ lb; Pig, 7 ℔ ton; Polished Sheet, 3cents ℔ lb; Galvanized 2½; Scrap Cast, $6; Wrought, 8 per ton,

	Store Prices.
Pig, Scotch No. 1, ℔ ton	32 00@34 00
Pig, American, No. 1	30 00@— —
Pig, American, No. 2	28 00@29 00
Pig, American, Forge	25 00@27 00
Bar, Refined, English and American	— —@75 00
Bar, Swedes, assorted sizes (gold)	85 00@100 00

	Store Prices, Cash.
Bar, Swedes, ord'y sizes, less 5 ℔ ct	—@110 00
Bar, Refined " "	75 00@ 80 00
Bar, Common " "	70 00@ 72 50
Scroll " "	97 50@125 —
Ovals and half-round " "	97 50@125 —
Band " "	92 50@ 95 00
Horse Shoe	95 —@— —
Rods, ¼ to 3-16 inch " "	82 50@— —
Hoop " "	102 50@140 00
Nail rod, less 5 ℔ ct	6¼ —@— —
Sheet, Russia, as to Nos. (gold)	10¼@— —11
Sheet, Single, D. and T. Common	4¾@— 6
Sheet, Galv'd, Nos. 14 to 26 10 and 12c. Nos. 27, 28, and 29, 13@14	
Rails, English (gold), ℔ ton	56 00 @58 00
Rails, American, at Works in Pa	70 00 @73 00

STEEL.—Duty: Bars and ingots, valued at 7 cents ℔ lb or under, 2½ cents; over 7 cents and not above 11, 3 cents ℔ lb; over 11 cents, 3½ cents ℔ lb, and 10 ℔ cent ad val. (Store prices.)

		Currency.
English Cast (2d and 1st quality)	℔ lb	— 15 @— 18
English Spring (2d and 1st quality)		— 7 @— 10
English Blister (2d and 1st quality)		— 10 @— 17
English Machinery		— 11½@— 14
English German (2d and 1st quality)		— 13 @— 15
American Blister "Black Diamond"		— — @— 12
American, Cast, Tool	do.	— 16 @— 17
American, Spring,	do.	— 9 @— 11
American Machinery,	do.	— — @— 12
American German,	do.	— 9 @— 12

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 20 cents ℔ lb; Manufactured, 45 per cent. ad val.

		All Cash.
Copper, New Sheathing,	℔ lb	— @— 30
Copper Bolts		— @— 32
Copper Braziers, 16oz. and over		— @— 32
Copper Nails		— @— 37
Copper, Old Sheathing, &c., clean		19 @— 20
Copper, Chili Pig		— @—
Copper, American Ingot		22½@— 22½
Yellow Metal, New Sheating		— @— 22
Yellow Metal Bolts		24 @— —
Yellow Metal Nails		— @— 22

LEAD.—Duty: Pig, $2 ℔ 100 lbs.; old Lead, 1½ cents ℔ lb: Pipe and Sheet, 2½ cents ℔ lb.

		Gold ℔ lb.
Galena	℔ 100 lbs	$— — @— —
Spanish (gold)		6 25 @6 30
German, do.		6 25 @6 30
English, do.		6 30 @6 50
Bar	(net)	8 75 @— —
Pipe	(net)	10 25 @— —
Sheet		10 25 @— —

TIN.—Duty: Pig, Bars, and Blocks, 15 ℔ cent. ad val.; Plate and Sheets and Terne Plates, 25 ℔ cent.; Roofing 25; ad val.

	Gold ℔ lb.
Banca	39 @40
Straits	40 @—
English	32½@33½

PLATES.

	Fair to Good Brands. Gold.	Currency.
I. C. Charcoal, ℔ box	$8 25 @8 75	$9 50 @10 00
I. C. Coke	7 00 @7 50	8 00 @ 8 75
Coke Terne	5 75 @6 75	6 75 @ 7 25
Charcoal Terne	7 37½@8 00	8 50 @ 9 25

SPELTER.—Duty: In Pigs, Bars, and Plates, $1 50

Plates, Foreign	℔ 100 lbs. $5 87½
Plates, Domestic	℔ lb. 8½

REMARKS.

IRON.—The demand for Scotch Pig continues light, but holders refuse to make concessions, the market closing steady at $32@32 50 for Glengarnock. There has been very little inquiry for American since the sales noted in our last, but full prices prevail. New English Rails continue in active request, and we notice sales of 1,000 tons, 56 lbs., to arrive, and 1,000 do. same, Southern delivery, on private terms. There has also been an active inquiry for American, and there are rumors of large sales, but we were unable to learn the particulars. There is no change in Refined Bar from store, the market being very inactive, and profits exceedingly small.

COPPER.—The Manufactures of Copper and Yellow Metal are steady at our quotations. Ingot continues to move very slowly, and we have only to notice sales of 200,000 lbs. Lake Superior at 22¼c. @ 22½c. Baltimore and Tennessee nominally 22½c. cash.

LEAD.—There continues only a moderate demand for Pig at prices without quotable change; 150 tons Spanish sold at $6 20 @ $6 25, gold. Manufactured is steady at the late advance.

SPELTER.—Since the business in Foreign, noticed in our last, the market has been quiet. Silesian is held at 6½c., gold.

STEEL—Continues very quiet and steady at our store quotations.

TIN.—Favorable telegrams from Europe and the East Indies impart additional strength to the market for Pig, and prices are strong and tend upward. At Singapore the price has further advanced $1 per picul, the quotation now being $32 50, costing about 1¼c. @ 1½c. ℔ lb. more, laid down here, than those of a week ago. At present Liverpool quotations, English would cost here 34½c. Sales have been made of 1,000 @ 1,100 slabs Straits and Malacca, at 33½c. @ 33½c., now firm at 34c.; and 100 do. Banca, 38c., now held at 39c. @ 40c.; English, 33½c.: all the above gold. Plates are also higher in England. At present Liverpool quotations, common brands Charcoal Tin would cost over $9, gold, laid down here. There is no stock here outside of dealers' hands; there has been considerable business, and prices favor sellers. The transactions embrace 2,500 bxs. Charcoal Tin, at $8 50 @ $8 62½; 600 do. Charcoal Terne, $7 62½ @ $8, gold; and 600 do. Coke Tin, 14×20, on private terms. Machen Terne are now held at $7 75, S. T. P., $8 12½ @ $8 25; and M. F., $9 12½ @ $9 25, all gold.

ZINC.—Sheet is steady at previous quotations, without further sales—the last sale of Messelmann, to arrive, was made at 8c. less 4 ℁ cent., gold, not 8½c. as misprinted in our last.

SPELTER.—Foreign, gold, 6½c.; Am., currency, 10c.

ZINC.—Sheet, 8½c.; white, French, 10c.; do. Am. 7c.

Mining Stocks.

NEW YORK, January 19, 1871.

Opertions in Mining Stocks are at a stand-still. Our quotations are almost a counterpart of those given a week ago. No sales are reported. The following is the report in full:

	BID.	ASKED
Bates and Baxter	25	—
Benton	10	—
Black Hawk	20	40
Central Gold	9	15
Consolidated Gregory	—	—
Grass Valley	—	—
Gunnell	—	—
Smith and Parmelee	—	30
N. Y. & Eldora	—	—
Quartz Hill	11	—

San Francisco Stock Market.

Our reports from the San Francisco Mining Stock Board per "Associated Press," dated the 17th, show an advance in all Comstock stocks, with the exception of Chollar-Potosi and Savage, which have slightly reacted. Annexed is the report in full:

Savage	49¾
Yellow Jacket	42
Kentuck	7
Chollar Potosi	69½
Gould & Curry	49½
Belcher	13½
Imperial	15
Amador	No sales.
Crown Point	—
Hale & Norcross	—

Petroleum.

Petroleum, "probably in sympathy with other mining stocks," is inactive to a masterly degree; not a sale is reported: a fact which suggests the query, Why are they on the list at all? which question we will leave to those who may be sufficiently interested in the matter to produce a solution. Without exception, all of the stocks quoted have materially declined in comparison with the corresponding quotations given in our last. Below is the report in full.

MISCELLANEOUS.—Lehigh and Susquehannah, $74 @75. A sale of 50 shares of Ornamental Slate Co. was effected at $74¾.

	BID.	ASKED
Bergen Coal and Oil	—	—
Bennehoff Run	11	15
Blood Farm	—	—
Breevoort	—	—
Bliven Oil	20	100
Buchanan Farm	35	—
Central	60	70
Clinton	—	—
Home	140	—
hillips Pet	—	—
Rynd Farm	25	—
United Petroleum Farms	10	—
United States	60	70
ational	—	—
ew York & Allegheney	—	—
orthern Light	—	—
ttnole Creek	—	—
at bone Oil	—	—
e cond National	—	—
berman & B	—	—
arr Farm	—	—

The Slate Trade.

[Corrected weekly.]

(A "square" represents 100 superficial feet.)

NEW YORK, Jan. 19, 1871.

In the Vermont trade the last few weeks of 1870 were very quiet, indeed. The amount shipped the past week is also very light, as will be seen by our tables. Week before last, we understand, there were no shipments whatever made from Middle Granville, and we hear of none from any of the other shipping points. Our correspondent at Poultney writes us that during the year 1870 there have been 30,666 squares of roofing slate shipped from that station. Considering the very dull state of trade the past year, this is a very good exhibit. We hepe our returns from Poultney station, during 1871, will be more regular than heretofore.

PRICES OF ROOFING SLATE.

Vermont purple, 1st quality, per square	$6 50@ 7 00
" green, 1st " "	6 50@ 7 00
" red, 1st " "	15 00@18 00
" variegated, " "	5 75@ 6 20
Pa. b'k and d'k blue, 1st qual., "	6 00@ 7 05

PENNSYLVANIA SLATE TRADE.

SHIPMENTS OF SLATE OVER THE LEHIGH VALLEY, AND LEHIGH AND SUSQUEHANNA R. R., AND THE LEHIGH CANAL:

For the week ending January 14, 1871.

LEHIGH VALLEY R. R.

ROOFING SLATE.

Girard Slate Co.	— squares
Jones & Williams	35 "
D. Williams & Co.	— "
Saylor & Morgan	— "
H. Williams	35 "
Lehigh Slate Co	70 "
American Slate Co.	— "
Hope	— "
Keystone	— "
Locke	— "
J. Anthony	— "
Kuntz & Woodning	105 "
Total	245 "

SCHOOL SLATES.

D. Williams	60 cases.
Lehigh Slate Co.	77 "
Locke Slate Co.	31 "
H. Kuntz	— "
Total	168 "

BLACK BOARDS.

Yerkes & Martin	14 "
Lehigh Slate Co.	— "
Total	14

MANTELS.

Yerkes & Martin	23 "
Lehigh Slate Co.	20 "
Total	43 "

MILL STOCK.

Jones & Williams	— "
Philada. S. Mantle Co.	— "
Lehigh Slate Co	22 "
Yerkes & Martin	— "
	22

TILING, &C.

Lehigh Slate Co.	— "
Yerkes & Martin	— "
R. Hughes	1 "
H. F. Martin	— "
	1 "

LEHIGH AND SUSQUEHANNA R. R.

ROOFING SLATE.

Twin City Slate Co.	— squares.
N. Y. & Penn.	— "
J. M. Coffin & Co.	— "
William Parry	— "
Mauch Chunk Slate Co.	— "
J. Beck & Co	70 "
Eagle Slate Co.	75 "
Continental	70 "
Heimbach Slate Co.	180 "
R. R. Custer	.. "
Total	345

SCHOOL SLATE.

Harper & Cartwright	— "
	— "
Total	— "

VERMONT SLATE TRADE.

REPORT of Slate Shipped from Middle Granville, N.Y., via the R. & S. R. R., for the week ending January 24, and for the year 1871.

ROOFING SLATE.

NO. OF SQUARES.	Week.	Prev'ly.	Year.
Penrhyn Slate Co.	....	....	....
New York Slate Co.	....	....	....
Middle Granville Slate Co.	....	....	....
American Slate Co	....	....	....
Benj. Williams	70	....	70
Jones & Williams	....	....	....
Eagle Slate Co.	....	....	....
H. W. Hughes	....	....	....
J. D. Jones	....	....	....
Total	70		70

MANTELS, &C.

NO. OF CASES.	Week.	Prev'ly.	Total.
Eagle Slate Co.	....	....	....
Penrhyn Slate Co.	266	....	266

MILL STOCK.

NO. OF CASES SHIPPED BY	Week.	Prev'ly	Total.
Eagle Slate Co.	cars 2	....	2
Penrhyn Slate Co	" —	—	—

An Ingeniously-Constructed Horse-Car.

THE Vallejo *Reporter* describes an ingenious California invention as follows: A horse-car is being built in the car shop of the California Pacific Railroad Company at South Vallejo which is quite a novelty. It is a new invention, patented by Mr. WILLIAM H. MASTERMAN, who was formerly foreman of the shop there. It is intended to be placed upon the track of the branch railroad from Vaca station to Vacaville, and it is to be run by horse power, the horse being inside the car, which is divided into two compartments, the rear one being fitted up for the accommodation of passengers. It is moved by an endless chain power, run with two cone pulleys. It can be reversed by the applicarion of a brake. One man, with the assistance of a horse, can run the whole concern.

An Elastic Preparation of Glue.

DR. SONNENSCHEIN reports (*Polytechniches Journal*) that when a thick solution of glue is mixed with tunstate of soda and hydrochloric acid, there is precipitated a compound of tungstic acid and glue, which, at from 30° to 40° C., is sufficiently elastic to admit of being drawn out into very thin sheets. On cooling, it becomes solid and brittle; but when heated, it again becomes soft and plastic. It appears that this material has been successfully employed instead of albumen in calico-printing, in order to fix the aniline colors upon cotton; it is also used in tanning, but the leather becomes as hard and stiff as a plank of wood. It is recommended as a lute or cement.

Western Progress.

TWENTY years ago there was not a shingle to shelter a man where Omaha now stands, with her 17,000 people, fifteen churches, five schoolhouses, ranging from $150,000 to $200,000 each, a bridge a mile long, in erection over the Missouri, eighty feet above low water mark, seven radiating railroads, and city lots one hundred and thirty-two feet deep selling for $400 the front foot.

Gun Cotton.

PROF. JOY says: "It is a well-known fact that a bag of gunpowder nailed on the gates of a city will blow them open. A bag of gun cotton exploded in the same way produces no effect. The gun cotton must be confined; in a bag it is harmless; exploded in a box it will shatter the gates to atoms. According to actual experiments made in England, a small square box containing twenty-five pounds of gun cotton, simply thrown against the palisades of a fortification, will open a passage for troops, while three times the quantity of gunpowder would produce no effect whatever, except to blacken the piles. Explosions of gun cotton under water were found to be equally effective. A more detailed account of gun cotton and collodion must be reserved for a future communication."

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" Friction of
" The great friction of produced by one mode of ventilation, and how reduced by another
" Pure added to impure (plans.
" Splitting of (plans)
" One current of (plans)
" One current of, and how to adopt separate currents (plan)
" Dividing of, but not into "separate and and distinct" current (plans)
" Crossings (see H on plans)
" Weight of in shafts
" How to find the weight of
" Table of pressure in shafts
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Construction of the New Patent Law.

The following circular has been issued from the U. S. Patent Office, Washington, D. C., December 10, 1870.

I. By the proviso of section 35 of the patent act, approved July 8, 1870, it is enacted as follows :

"That when an application for a patent has been rejected or withdrawn prior to the passage of this act, the applicant shall have six months from the date of such passage to renew his application or to file a new one ; and if he omit to do either his application shall be held to have been abaudoned."

The construction placed upon this proviso by the office, so far as it relates to rejected cases not withdrawn, is to be found in the decision of the Commissioner of Patents, rendered in the case of J. MILLSPAUGH, Sept. 21, 1870, which is in the following language :

"In this case the attorneys for applicant file the following paper :

"In the matter of," etc., "filed September 20, 1869, and rejected by the board of examiners June 25, 1870, we beg leave to renew the same, in accordance with act of Congress relating to patents, approved July 8, 1870, and to retain model, drawing, and papers heretofore filed, to constitute the renewed application. The case is respectfully submitted to the board of appeal for their further action."

"This paper is similar to a large number, filed by various attorneys, except that the last paragraph is usually omitted. Some seem to suppose that the effect of such a request is to begin the case *de novo*, while others imagine that by filing such a paper they 'keep the case alive' for two years, during which time they may or may not take or request further action. Both opinions are errors. The act of July 8, 1870, section 35, was intended for no such purposes. The sole intent of the second proviso of that section is : 1. To permit withdrawn cases to be refiled, in which case, of course, they begin *de novo* ; and, 2, To permit rejected cases to be renewed ; that is, to be revived and continued under the new law. The prayer for renewal is a prayer for further action, and the effect of it is simply to demand such action as shall set the case in motion. Section 32 provides 'that all applications for patents shall be completed and prepared for examination within two years after the filing of the petition, and in default thereof, or upon the failure of the applicant to prosecute the same within two years after any action therein, of which notice shall have been given to the applicant, they shall be regarded as abandoned by the parties thereto,' etc. It will be observed that the two years run, not from action by the applicant, but action 'of which notice shall have been given to the applicant,' *i. e.*, action by the office.

"The petition for renewal is but a part of the action necessary on behalf of the applicant to revive his case. To complete that action and make it effectual, his petition must be accompanied with a specific demand for such proposed action as the status of the case may require. Thus, if the case has been but once rejected the petition for renewal must be accompanied by a demand for a second examination, or by an amendment. If it has been twice rejected the petition will accompany the appeal or the prayer to the Commissioner for further leave to amend. If it has been rejected by the board the petition must be filed with the appeal to the Commissioner. If it has been rejected by the Commissioner, there can be no renewal, unless an appeal to the supreme court of the District of Columbia has been taken.

"Petitions for renewal do not differ in this respect from the petition for an original or reissued patent, or for the renewal of an application upon which the final fee has not been made, for an extension, or for an appeal. In all of these cases action is proposed or requested, which, it is expected, the office will proceed to make with reasonable diligence.

"I hold, therefore, that the filing of a naked petition for the renewal of a rejected application does not of itself renew the case ; and that if such petition is not accompanied or followed up by a demand for the action appropriate to the next stage beyond that at which the renewal finds it, the case will, after January 8, 1871, be treated as abandoned."

II. Conformably with the foregoing decision, a case is regarded by the office as *rejected*, within the meaning of section 35 of the patent law, and for that reason requiring a formal renewal in order to save it from forfeiture on the ground of abandonment, if, having been once acted upon adversely by the primary examiner, it had not, prior to the 8th day of July, been so re-presented to the office by the applicant or his attorney as to entitle it to further consideration, and did not, therefore, at that date stand upon the docket of pending cases. Also, a case once rejected is not regarded as renewed unless the petition therefor be accompanied by an amendment of the case or by a request for the re-examination of it without amendment ; nor, if a case has been twice rejected by the primary examiner, or has been rejected on appeal either by the examiners-in-chief, or the commissioner in person, it is to be regarded as renewed unless accompanied by an appeal, as provided by statute, from the last decision rendered.

III. All papers filed by a rejected applicant, purporting to constitute a renewal of his application, but which fail to comply with the conditions prescribed in the decision above quoted as essential to a valid renewal, will be treated by the office as of no effect ; and the examiner will at once notify the party by letter what additional steps may be necessary in order to perfect the renewal of his case. A copy of this circular will be enclosed in such letter.

SAMUEL A. DUNCAN,
Acting Commissioner.

In relation to this decision, we have received from an intelligent Washington correspondent, formerly connected with the Patent office, the following letter :

TO THE EDITOR—SIR : On behalf of many oppressed inventors, allow me, through your excellent paper, to suggest briefly how the new patent law may be construed, so as to be consistent with itself and with justice. The meaning of the last proviso of the thirty-fifth section of the law depends upon the meaning given to the words *rejected or withdrawn*.

But this whole section is construed and limited by section 111, which says : "Provided also, that all applications for patents pending at the time of the passage of this act, in cases where the duty has been paid, shall be proceeded with and acted on in the same manner as though filed at the passage thereof."

Now, this proviso covers all applications for patents pending July 8, 1870, though such cases were partially, but not fatally, rejected ; whether one claim in forty had been rejected, or all the claims once or twice rejected, by the primary examiner, or on appeal to the examiner-in-chief, or to the commissioner in person, provided the limit of appeal to court had not expired, and two years had not elapsed after filing the case.

Thus Sec. 35 is limited to a special class of rejected cases, to those finally and fatally rejected, and needing a special law to revive them. The official decision of Sept. 21st is correct in requiring a rejected case to be amended or put in proper form for the next official action ; but the so-called renewal upon which the decision is based is in itself an erroneous assumption both by the applicant and the office. No renewal was required, for the case had not been finally rejected. It was only partially rejected, and was yet a pending case that could be farther prosecuted under Sec. 111 of the law, without any formal renewal.

If the present official construction be enforced, the rights of an inventor may be declared abandoned after only six months delay, which is too monstrous to be accepted in view of Sec. 32 of the law and the time-honored right of two years time prior to abandonment. Therefore, in my opinion, the law should be construed so as to make it consistent with itself. Sec. 111 protects, for two years, all cases not fatally and finally rejected or withdrawn, and Sec. 35 applies only to such cases as are fatally rejected, and require a special law for their revival.

D. B., M. D.

WASHINGTON, D. C., Jan. 9, 1871.

[The root of the difficulty appears to us to lie in the discrepancy of Sections 32 and 35, one of which seems to fix six months, and the other two years, as the limit of abandonment. Practically, we do not see that the decision of Mr. DUNCAN need trouble inventors much, as it only requires a "demand" to accompany a "petition"—a condition which it is not difficult to fulfill ED.]

The Great Canons of the Colorado—Lecture by Major Powell at Cooper Institute.

The second in the course of free scientific lectures under the auspices of the Cooper Union was delivered by Major POWELL before a large audience, his subject being the "Explorations of the Great Canon of the Colorado." He said that the Colorado River was formed of a junction of the Grand and Green Rivers. The region of country through which they flowed was 750 miles in length, and 550 in breadth, with scarcely sufficient vegetation to relieve the monotony occasioned by an almost unlimited rock. This region he described to resemble a basin cut off into two distinct portions, the upper two-thirds lying from 5,000 to 8,000 feet above the level of the sea, when it dropped down so suddenly that the lower third was a little above the level of the sea, with the exception of a mountain ridge rising over the plain. The mountains from 8,000 feet to 14,000 feet high were everlastingly covered with snow, which gave birth to a hundred rivers rushing down the sides, and cutting for themselves a channel in the solid rock.

Some years ago he formed the determination of exploring the Colorado, which cut its own course for several hundred miles in a deep gorge, and he left his party in the Wasach mountain, with a small party in three boats. They shaped their course to a point where the Pacific railroad crossed the Green river, and took the water at its junction with Grand, provided with two months' rations. He vividly described the magnificent grandeur of the scenery through which they passed, whose nature, in its sublimest form, untouched by the hand of man, appeared, and gave an interesting narrative of their vigils, their observations of altitudes, localities, velocity of the water, and the geological nature and formation of the rocks. With endless variety, danger and delight they pursued their exploration, overleaping innumerable cataracts, entering interminable arches, where a ray of the sun was almost totally unknown, and of necessity compelled to brave innumerable difficulties and privations. When all but two days' rations were gone, three of his men deserted him and went inland, where they were subsequently overtaken and slain by Indians. Finally they came to the end of their journey, having completely traversed the vast extent of territory, and though obliged to suffer great pain and endure privations, the result thoroughly satisfied them, and remedied a want in the geographical history of the country which was indeed inestimable. The lecturer was repeatedly applauded during the delivery of his address.

REPORTS OF BULLION SHIPMENT.—The shipments of gold from three banking-houses in Central City, Colorado, during 1870, amounted to $1,210,625. The estimated gold product of Gilpin county for the same period was $1,200,000.

On Rough Surveying.

GEOMETRY furnishes means of representing with mathematical exactness the configuration of a country, or more generally of any object whatever. The application of these geometrical laws has received the name of surveying. However, we are obliged to recollect that the customary proceedings are slow of application, require a great quantity of costly and unwieldy instruments, and the presence of assistants, rodmen, chainmen, flagmen, etc., and, consequently, cannot be employed except for a project the importance of which is sufficient to pay the necessary high expenses. It is true that in this case the work has a complete exactness, or at least possesses a degree of exactness depending only upon the personal skill and experience of the operator. But it occurs very frequently that such a perfection is, if not useless, at least not very necessary. Let us suppose it is intended to make the preliminary survey of a projected railroad, or since this article is written especially to meet the wants of the mining engineer, let us suppose it is intended to make a report on a mineral region. In this case the first care of the engineer will be to survey the locality, not definitely, but in such a way that it will be possible to represent plainly on the map the disposition of the outcrop, the approximate direction of the metallic veins, the principal features of the ground, the distance of the roads, canals, railways, in one word, a map on which it would be easy to show to the stockholders of a company, or to the owner of the land, the value of the ground and the chances offered for successfully working its mineral resources. Those mines are mostly situated in remote and wild countries, where the expenses of transportation are important, and, consequently, the engineer has to find the means of dispensing with heavy instruments like a transit or level, and the help of one or more intelligent or practical assistants. He must either act alone or, if under such conditions the work is completely impossible, be contented with the help he can get from an ordinary man, no matter how little educated he is.

We intend to show how a survey may be made rapidly, with a few simple instruments, without help and with sufficient accuracy for all practical purposes.

Surveying consists of three principal operations :

1st. The measurement of distances made with a chain or a metallic tape and the help of two chainmen.

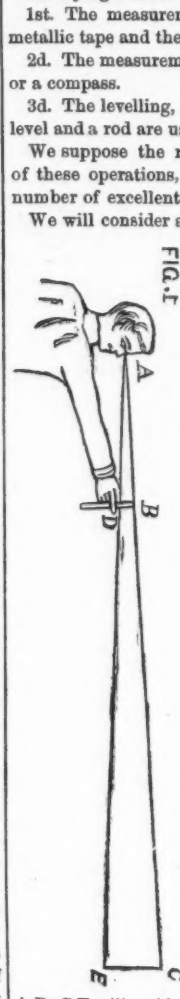
2d. The measurement of angles with a theodolite, a transit or a compass.

3d. The levelling, study of slopes or contour lines, where a level and a rod are used.

We suppose the reader perfectly acquainted with each one of these operations, concerning which he can refer to a great number of excellent books—GILLESPIE'S, for instance.

We will consider at first the measurement of distances.

FIG. 1.



In drawing from nature, painters measure with their pencil or any rigid stick that they hold in the hand, stretching the arm, the apparent size B D of an object C E, and then present again the length B D before another object, in order to compare the respective sizes. They discover in this way whether the perspective of the latter has to be greater or smaller than that of the former, and they try to judge approximatively of the existing relation. If in their sketch they have represented the first object an inch in length, and if by the preceding operation they know that the second is about three times as big, they will represent it by a line three inches long. By a repetition of the same operation, they will obtain as a final result a general view, the more exact the longer practice they have had at this kind of work.

We observe that when we use no scale, and are obliged to guess at the true dimensions of an object from its apparent size, we leave great chances of inaccuracy. However, if we draw the sketch on the paper, using the apparent signs, as we measure them on the pencil, we will avoid the errors of guessing and the exactness will be greater ; the scale will be uniform, and we are so induced to try to determine the scale.

If A C equals 100 times the distance A B, C E will evidently be equal to 100 times B D, or B D will be the 100th part of C E, and the scale of the sketch will be 1-100th. If A C was equal to 200 times A B, the scale would be 1-200th. We could even take one-half, one-third, one-quarter, etc., of the apparent dimensions, or multiply them by two, three, four, etc., according to the size we want to give to the sketch, and whatever way we proceed, the scale will be an exact one and easy to determine. If the pencil was divided in tenths and hundredths of feet, we could, from the relation between A C and A B, know the true size of C E. This relation being of 100 to 1 ; for instance, if B D is 1-10th of a foot, C E will be ten feet. The question is therefore to determine the relation between A C and A B.

We see on the figure, that A B, the distance at which the pencil is held, is variable for different persons, and even for the same person, when he does not pay sufficient attention to it. The best way to have this distance invariable is to stand side-way, as is represented in the figure, to stretch the arm slightly without stiffness, and hold the pencil in a direction perpendicular to the line going from the eye to the object considered. After a little practice, we can obtain very easily this result. Let us draw now on a vertical wall a line four feet wide, for instance, take a small rule divided into decimal fractions of a foot and hold it stretching the arm, then go backwards until the apparent height of the line on the wall measured on the rule is 4-100th of a foot. In this moment the distance from the observer to the wall is equal to 100 times the distance from his eye to the extremity of his arm. Let us suppose the former to be 213 feet ; we conclude the latter equal to 2.13. Such is the result given by experience for a man of middle size. For a greater security, the observer can hold a piece of string cut to the length found by former experience and terminated by two knots, one extremity tied to his thumb, the other between his teeth. Knowing three of the four dimensions A B, B D, A C and C E, we will find easily the fourth one. Designating A C by x, C E by H, B D by h, and A B distance unchanged for every one in particular, and we supposed equal to 2.13, the similar triangles A B D, A C E give us the following relation :

$$\frac{AC}{AB} = \frac{CE}{BD} \text{ or } \frac{x}{2.13} \quad \frac{H}{h} \text{ and } x = \frac{H \times 2.13}{h}$$

[TO BE CONTINUED.]

THE ENGINEERING AND MINING JOURNAL.

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The Geological Exploration of the Fortieth Parallel.

THIS exploration, which was organized early in 1867, by the appointment of Mr. CLARENCE KING as Geologist in charge, has been vigorously prosecuted in field and office-work, for four years past; and we now receive the first fruits in the publication of a magnificent quarto, illustrated with thirty-seven plates and an atlas, and containing the report of Mr. J. D. HAGUE on the mining industry of the regions adjacent to the fortieth parallel. A note prefixed to the volume informs us that the following reports will constitute the series embodying the results of the whole survey: I, Systematic Geology; II, Descriptive Geology; III, Mining Industry; IV, Zoölogy and Palaeontology; V, Botany. The present or third volume has been first prepared and published, because its subject is most directly applicable to the material development of that great extent of mountain territory opened up by the Pacific railroad. The other volumes will be pressed to completion with all possible rapidity, and the atlas of topographical and geological maps, necessarily the latest of the publication, is promised in the course of the present year.

We take leave to doubt the exact fulfillment of this promise. The atlas may indeed appear this year; but the four volumes which, it is implied, are to precede it, will certainly stick fast longer than that in the hands of the public printer, if the experience of the past is any guide for the future. But we shall be thankful for them whenever we get them; and meanwhile there is much matter for praise and satisfaction in this splendid volume which lies before us.

Mr. KING himself contributes to the book three chapters. The first is an essay on the distribution and geological character of the western mining districts. It is highly interesting and suggestive; but we must not be betrayed at the present time into a discussion of its broad generalizations. They will doubtless be the object of much attention at the hands of geologists; and we shall take a future opportunity to give them the special notice which their striking character and able presentation deserve.

Mr. KING'S second contribution is an elaborate description of the geology and structure of the Comstock lode, which he considers to be a connected group of fissures, occupying, during the middle of its course, a line of contact between syenite and overflows of propylite. As this fissure-system is later than the propylyte, and as the latter is itself a recent volcanic rock, it is concluded that we may safely call the Comstock a Tertiary lode. The arguments by which these views are enforced rest upon numerous careful observations, and are illustrated by a series of beautiful plates, giving sections of the vein at different points. Nothing approching to this in extent or elaboration has ever been produced upon the subject, though the literature of the Comstock lode is already quite voluminous. We purposely abstain from the expression of a decided opinion concerning the theory maintained. A hasty endorsement upon a first perusal would have no value, and a hasty dissent would be still more rash.

Mr. KING'S last contribution is a chapter on the Green River coal basin, in which he shows the coal-beds imbedded in the sandstones along the east base of the Wahsatch range to be of Cretaceous age. Since many of the beds east of Green river are admitted to be Tertiary, it appears that the coal-deposits extend from the upper Cretaceous into the Tertiary. This view would end the strife hitherto waged over the question of the geological age of the Rocky mountain coals. We are under the impression that Professor HAYDEN has recently confessed as much. The principal portion of the volume is occupied by Mr. J. D. HAGUE, who contributes chapters on the Comstock mines; the treatment of the Comstock ores; Central and Eastern Nevada; Colorado; gold mining in Colorado; and silver mining in Colorado. Mr. HAGUE is one of the best mining engineers in this country, and his reputation will certainly not suffer from the manner in which he has executed this important task. Since this work is intended for permanent rather than temporary use, he deals by preference with those features of his subject which will always be interesting and profitable, such as the general vein-phenomena, the machines and processes of mining and metallurgical treatment.

Descriptions of particular mines are given where these have a typical character or a historical importance. The account of the Comstock mines fills up, as it were, the details of the picture outlined in Mr. KING'S discussion of the lode itself, and will be welcomed in Europe as well as this country, since it gives to scientific men abroad the means of studying a world-renowned American industry.

Of the Sutro tunnel Mr. HAGUE says: "If the lode is to be mined at such a depth as the tunnel proposes to reach, there can be no doubt but that it affords the most reasonable, if not the only profitable method of doing so." He advocates, however, the testing of the vein in depth by means of shafts, and concludes: "Should these explorations now in progress prove the existence of ore bodies in depth, the tunnel would become a great desideratum, if not an absolute necessity."

The chapter on the treatment of Comstock ores is impartial, rather than critical, in tone. It is evidently intended to give a careful picture of facts as they are, leaving others to build theories or devise novelties.

An excellent discussion of the chemistry of the Washoe process by Mr. ARNOLD HAGUE completes this branch of the subject. The plates of hoisting-works, stamp-mills, pans and other machinery here and everywhere throughout the book are superb, and reflect great credit on Mr. JULIUS BIEN, of this city, at whose establishment they were engraved.

But we find it impossible to give within the limits of a single article even a synopsis of the contents of this volume. The frequency with which we shall refer to it hereafter will testify our appreciation of its value. We must not forget, in closing, to note the contributions of Mr. S. F. EMMONS on the geology of the Toyabe range, and on the Egan Cañon district. The *Atlas* contains R. H. STRETCH'S celebrated plans of the complicated workings of the Comstock mines, and several fine topographical and geological maps of Washoe, the Toyabe, White Pine, etc.

City Railroads.

VARIOUS are the schemes which have from time to time been advanced to solve the knotty problem of city transit. We have had arcade railroads, underground railroads and aërial railroads, according to various models—proposed—but none of these have as yet proved adequate to the wants of our citizens, in other words only one, on the elevated principle, has been constructed. After repeated failures to put this into successful operation, we believe that the attempt has been abandoned, at least for the present. The others have made a fine appearance on paper, the only form in which they have ever existed, except in the fertile brains of their projectors. Our new Commissioners of Docks have for several months past been considering various schemes for providing a uniform water-front, most of which embrace the plan of building freight and passenger railways along the proposed line.

We have taken our ideas on this subject mainly from reports concerning the London Underground Railway, which has been almost universally represented to be a great success. Hence it is rather startling to read in a recent number of our English contemporary, *Engineering*, "It seems somewhat strange that in our metropolis, passenger tramways should only at the present time begin to be recognized as a convenient and practical way of conveying the great mass of street travellers; that a system of immensely costly railroads should have been constructed before the cheaper and comparatively efficient means of supplying the traffic requirements should have received a fair trial. The experience of many years in the United States had shown that street railroads were highly convenient, and, for the most part, commercially successful; yet it was preferred to expend millions of pounds in building lines, which have certainly not fulfilled the expectations of those who found the money for them, rather than to pay one-twentieth of the sum in laying down lines of tramways, the routes of which were less arbitrary, and which ought to have commanded a fair share of success. It is noticeable that those engineers whose names have been conspicuous in the construction of our metropolitan railroad system, are now foremost in promoting our tramways in London, and one cannot help reflecting that if the order of events had been reversed, the public might have been almost as well served and shareholders better satisfied."

For years we have felt the inconvenience of the slow moving street-cars, and have based our grumbling against them mainly on the supposition that in other large cities a substantial relief had already been provided, and we now find that we were misinformed.

To be sure, we make it a point in New York to live as far away as possible from our places of business; and within certain limits a man's respectability may easily be deduced therefrom; hence the need of a quick method of transit is perhaps more severely felt in this city and Brooklyn than in any other city in the world. But in our grumbling at the present means of transit, we are also apt to forget the rights of the stockholders in our eagerness to vindicate those of passengers. *Engineering* informs us that the London underground railways have not been financially successful, a fact that we are not disposed to doubt, especially when we consider the immense cost of construction. But we think that our contemporary does unintentional injustice to the pecuniary success of our horse-railways. They give a table of the expenses and receipts of the city railroads, taken, we suppose, from the annual returns of the companies. Let us examine the statement of the Third Avenue Company, for example. The capital stock paid in is given at $1,170,000, and on this sum it pays an annual dividend of 12 per cent., a return which our contemporary considers handsome.

We have not the exact data before us at present to show just what the capital stock of the Third avenue railroad originally was; we are very confident in the belief that there never were more than $200,000 actually paid by stockholders into the treasury of the company. Almost everyone in this enlightened land knows how the stock affairs of companies in the United States are generally managed.

In but very few instances, is the entire nominal par value of the stock paid into the treasury. There was a law on the statute book of this State which required this to be done within two years after the formation of the company under the penalty of the forfeiture of the charter, but this law was so easily evaded that it has long been practically inoperative, and has, we believe, since been repealed. Hence when we are informed that the Third avenue railroad company pays a dividend of twelve per cent. upon a capital stock of over a million of dollars, we have but little difficulty in perceiving that it is actually a dividend of nearly a hundred per cent. upon the original investment. From a comparison of the other companies, our contemporary, *Engineering*, finds that but few companies are so successful, while some are actually worked at a loss. Now, though it requires more financial ability than we possess to convert an actual loss into a gain, a feat which we leave to the political journals, still we think that it is easy to show that the actual earnings of several of the railroad companies amount to nearly or quite a hundred per cent. There are a few companies that do not pay any dividends at all, but would it not be astonishing if all that a company had to do, in order to secure a return of even ten per cent. per annum on their capital, was to obtain a charter for a city railroad? The argument used by our contemporary, is that though railways pay in the city of New York, they are not surprisingly lucrative; and in London, where the prejudices of the people are against such conveyances, they would in all probability not pay at all, and it is simply our desire to correct the misapprehension which so easily arises from the perusal of the statistical table given that has dictated this article.

SCHOOL OF MINING & METALLURGY,
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Panoche Grande.

THE McGARRAHAN CASE has been decided by the House Judiciary Committee against him and in favor of the New Idria Company. The vote in the committee is said to have been seven to three. We understand that the minority will present a report; and the fight in the House promises to be lively. Recent revelations concerning the alleged mutilation of the records of the Land Office, and the destruction of a patent once issued to the Panoche Grande (McGarrahan) Company, tend to turn public sympathy towards that side. The New Idria Company will have a tough time of it in the House.

The Mineral Wealth of Arizona.

THE following article from the San Francisco *Evening Bulletin* gives the most reliable summary of the state of mining matters in the Territory of Arizona. The Mr. EILERS referred to in the article is the accomplished deputy of the Commissioner of Mining Statistics, and has but recently returned with a large amount of information, which will be published in the next report of the Commissioner:

"The principal districts visited by Mr. EILERS are the Wickenburg, Date Creek, Bradshaw, the Walker or Lynx Creek, the Hassayampa, Big Bug, Goodwin, Turkey Creek, Sacramento, San Francisco and La Paz; and Bill Williams Fork, Eureka and Castle Dome, were included in his researches. With very few exceptions he has, consequently, seen all the districts north of the Gila, and certainly all the mines worked at present. His opinion in regard to many of these mines is, in the main, favorable, but he says that although Arizona has an abundance of what in other countries would be called exceedingly rich mines, the time has not come when the majority of them can be worked at such a profit as would induce capitalists to invest large amounts of money. There are mines of the latter class, some worked and some untouched, but the utmost caution and circumspection are required to pick out the right ones; not so much because the existence of true or really rich veins is doubtful, but principally because the circumstances surrounding mining in the various localities in the territory are vastly different. It is well known that in Arizona the items of wood, water and transportation assume higher importance than they can have in an older and more civilized country. Southern and western Arizona are, on the whole, devoid of wood and water, although in certain portions both are found even here to a limited extent. Through middle Arizona extends a belt some 60 or 75 miles wide, commencing at the Willows on the Mohave route and reaching in a south-easterly direction to the river Gila, in the neighborhood of the line of New Mexico. This belt contains a comparative abundance of wood and water. The former is, in many localities, all that could be desired, and compares very favorably with the best mining countries now known, while it surpasses Nevada, Idaho, Utah, and portions of Montana and New Mexico. As to the running streams of this portion of Arizona, not quite as much can be said. Nevertheless, there is plenty of water for the ordinary purposes of quartz-mining, milling and smelting,

while for hydraulic mining the supply is in all cases insufficient.

"The placers and gravel deposits of Arizona are very extensive, especially east of La Paz and on both banks of the Gila river in the neighborhood of Gila City, Los Flores and Oroville. The geological formation of the country and the probable source of the gold are in both localities very similar. The main mountain chains are composed of syenite, which is cut by dikes of greenstone and greenstone slate, while against their foot lean strata of metamorphic slates, which are also frequently crossed by greenstone and greenstone-porphyry. Large gold-bearing quartz veins are found in many places on the contact between the syenite and greenstone slates, and in the metamorphic strata of the foot-hills an immense number of what appear to be small gash-veins occur. A large proportion of these are gold-bearing, and probably the source of the placer gold. The gravel is mostly composed of these slates, and is mixed with very little earth. The pieces are not much worn but angular and sharp, and the deposits continue only until the ravines strike the open mesa. If it is remembered that the detritus is only occasionally—usually twice a year—subjected to the action of the heavy floods resulting from short but violent rain storms, and that for the balance of the year there is no stream at all to act on it, that there is even hardly any moisture in the air to help decomposition, we can see at once why these placers wear a different aspect from those of California and other more northern countries. The gold found in both the above-mentioned localities is very pure, and generally worth $19 75 per ounce. Nearly all extracted so far has been taken out by dry-washing, a process which is practiced in a small way by Mexicans and Indians. All the gold brought to market is thus naturally coarse, and as all the fine gold, which preponderates both in the placers and the veins, is lost, the business has thus far not been very productive for white labor. Lately, however, a dry-washing machine has been used in the La Paz placers, which extracts from $20 to $30 per day, employing three men. Even this machine, however, cannot save the finest gold; in fact this is impossible without water and quicksilver, especially where so much of the gold is leaf-gold. The gold deposits at and near the Gila cover the foot-hills of several large mountain chains, and as they are located immediately on the banks of the river, a better chance is offered to utilize them. The Gila has for 200 miles from its mouth very little fall, and is especially very sluggish for many miles above the gold deposits. Thus water for hydraulics cannot be easily brought to these hills by ditches, and an association of San Francisco gentlemen has therefore commenced a somewhat novel, and at the same time rather costly enterprise. They pump the water from the Gila on top of the hills, into a reservoir, by means of a powerful engine and nine-inch pipe, and take it from here to any surface they wish to attack. They are thus forced to submit to a continuous tax, which exceeds that usually paid for water. The hill they have attacked first has been worked over and over again by Indians and Mexicans, for many years; still they are quite satisfied with their present results.

The placer gold found along the upper Hassayampa, Lynx and Big Bug creeks differs materially from that of the above-named placers. It is much finer in size and not near as pure. Its value ranges from $15 to $17 per ounce. Nor are the placers on these streams near as extensive as those of the La Paz and the Gila. Winding their way through narrow gorges and between steep and high mountain sides in the Sierra Prieta, a broad chain of mountains falling off abruptly on all sides, these creeks have only accumulated narrow strips of ground along their banks, which widen out in rare instances to bottom lands of larger size. No gravel mining has therefore been carried on here on a large scale, with one exception—the hydraulic claim of the JACKSON BROTHERS, on Lynx creek. Lack of water keeps even these works idle over half the time. The claim is rich and sufficiently large to last for years. Many miners work on the creeks with rockers and sluice-boxes, and the fact of their continuing the work which was commenced years ago, speaks well for the richness of the deposits.

Of course, in a country where placer gold abounds in every valley and gulch, there can be no lack of gold-bearing veins, and such is really the case in the neighborhood of Prescott. The number of veins found in the Hassayampa, Lynx Creek, Big Bug, Bradshaw and Goodwin districts is astonishingly large, but all of them have the unpleasant peculiarity that already, at the inconsiderable depth of from twenty-five to fifty feet, the decomposed surface rock changes into sulphuret-bearing quartz. With the exception of a few veins in the Goodwin district, the outcrops and upper portions of the veins are a very brittle quartz, containing many cavities filled with hydrated oxyd of iron, some carbonate of lead and occasional copper stains. In some of these veins the gangue is so soft as to crumble under the touch of the fingers. In the Goodwin district the quartz is harder and less cellular. These veins contain from $20 to $100 in gold per ton of rock; the average is probably about $25, though individual mines, worked only for a short time on the surface, have yielded an average of $90. The size of the veins varies greatly, but on the whole, small veins from eighteen inches to three feet, are predominating. The country rock over this whole region is granite and syenite, containing dikes of porphyry and greenstone. Few metamorphous slates are found, except near the Eugenia mine, on Big Bug; the Accidental, on Lynx creek; a group of veins on Bradshaw mountain, in the neighborhood of Maple Gulch, on the upper Hassayampa, and near the Bully Bueno, on Turkey creek.

Of all the veins in the neighborhood of Prescott, only twelve or fifteen are worked at present. Only three mills are erected, and most of the ore is worked in arastras. It is true, there are many more veins which would pay handsomely at present; but, on the whole, it is not strange that capital is slow to invest here, for although the veins are permanent, and nearly all sufficiently rich under ordinary circumstances, there are many drawbacks to successful mining. The most serious of these is the danger from the Indians, which continually hangs like a cloud over a mining enterprise in this vicinity, the high cost of transportation from San Francisco (sixteen cents per pound), and the difficulty of extracting the gold from the sulphurets of iron, zinc, copper and lead. In many of the veins, it is true, these sulphurets occur so solid as to permit the complete extraction of the precious metals by the smelting process, but this process can only pay whenever cheap transportation will enable the miner to dispose of his base metal also. The same difficulty, that of high transportation, stands in the way of successful chlorination by the Plattner process, and there remains, consequently, only the process of ordinary roasting by which, as it is well known, not more than eighty per cent. of the gold can be extracted. Experiments now under way with the Stetefeldt furnace may obviate this difficulty in relation to gold-bearing sulphurets, but nothing positive is so far known.

Besides the Big Bug, in the neighborhood of Presscott, the Vulture company, in Wickenburg, is the only large gold-mining enterprise in the Territory which is successful, and this, too, in the face of the most extraordinary expenses. The Vulture is so rich, and at the same time so extensive a deposit of gold-bearing quartz, that it deserves a more extended notice. The rocks in the neighborhood of the mine, fourteen miles south-west from the town of Wickenburg, are partly metamorphosed standstones and quartzites, highly colored by oxide of iron. Through these runs, in an east and west direction, a zone of talcose slates, about 150 feet in width, and in this zone occur the deposits of gold-bearing quartz. The work done at the mine thus far discloses and sufficiently defines the nature of the deposit. There is one main quartz band, from twelve to eighteen feet wide, which, although running with the strike of the slates, has, nevertheless, many characteristics of a vein. It is continuous as far as penetrated, both lengthways and in depth; has a regular selvage on one wall, and the gold is distributed through it in a remarkably even manner. This body is explored, and the quartz has been subjected to a working test for a length of 300 and a depth of 265 feet. But the work done at the surface, on top of the hill, whose backbone is formed by the above-mentioned quartz vein, discloses other, but smaller, bodies of quartz in the slate. These are scattered across a zone of eighty feet in width, and even the slate yields remarkably well in many places, which can be recognized by the square cavities filled with oxide of iron. In this locality the mine is worked like a quarry, and a hundred thousand tons of quartz would be ready for the mill right here, if the machinery could be located at the mine. But there is no water nearer than the Hassayampa, fourteen miles distant. Hauling the quartz to that point costs $8 per ton, and the ore yielding below $25 per ton cannot be worked to a profit at present. Only the better class is worked now, while $12 to $16 rock is stored away for the future. Seventy tons per day are thus hauled to Wickenburg at an expense of $560; in other words, $200,000 are spent annually for transportation of the ore alone, while it would not cost near that to bring sufficient water for a 100-stamp mill from the Hassayampa to the mine. In the mining works no water has as yet been struck, and it is not likely to be found until the shafts get below the level of the mesas, near the south-west foot of the hills. While this absence of water is not desirable as far as milling on the spot is concerned, it is greatly to the advantage of the company in another respect, inasmuch as there are few sulphurets as long as there is no water. So far the gold is perfectly free and easily extracted. The company's mill is a substantial structure, located on the Hassayampa river, one mile above Wickenburg. It contains forty stamps with copper plates and blankets, and eight Henderson concentrators. The concentrated tailings are the few sulphurets contained in the rock. They are rich in gold, over $300 per ton, but are not worked at present for lack of apparatus. The sluice tailings contain $5 per ton, and are saved for future operations. About 80,000 tons lie now below the mill. The company's buildings around the mill, an office, assay office, boarding-house, lodgings for the men, and stables, are all substantial adobe buildings, with shingle roofs. The buildings at the mine are constructed of stone, and remind one more of the mining enterprises of Europe than of those of the United States. As soon as a sufficient supply of water is struck either in the mine, or brought to it, the Vulture will certainly have no equal in the world.

"Of all the mines in Arizona, those along the Colorado river are at present the most inviting for outside capital. The transportation to and from these mines is by far lower than in any other portion of the Territory, and wood can be obtained along the river at reasonable prices, in case that smelting on the spot should be carried on. For some of the districts, as for the Sacramento and Williams' Fork, this would be the most advisable; while for the others, transportation is so low as to leave it doubtful whether shipping of the ore or smelting in the district would be the most economical.

"The ores in the Sacramento district, 30 miles east of Mohave city, are lead and copper ores, both carrying silver. The lead ores are carbonates and galena, and their contents of silver vary from $25 to $125 per ton. One small vein in this district contains extremely rich fahlores, assaying over $300 per ton. This ore is quartzy, and the vein is located in the immediate vicinity of several large veins of solid galena, so that all might be worked by the same company, and the silver extracted by adding the fahlores to the charges of galena. Wood and water are present in sufficient quantities for years to come. The Union and Savage are the most important lead veins now worked. The former especially is an enormous deposit of about nine feet in width, and carries almost solid ore. The most important copper vein is the Antietam, a two and a half foot vein of green carbonate, red oxide and gray sulphuret. The ore contains from $30 to $60 per ton in silver. Transportation from this district to the river costs $17 to $20 per ton, from there to San Francisco $18 to $20. Supplies from San Francisco to the mines cost about 4½ cents per pound. The San Francisco district, ten miles from Hardyville, contains some remarkable gold veins, the most important of which is the once renowned 'Moss Lead.' A large amount of work has been done here, but singularly enough, very little on the vein itself. None of the tunnel work, for instance, of which there are hundreds of feet, has ever reached the vein, and the only shaft that struck it never went through it. All this is the more remarkable, as the vein has a very large outcrop, and is plainly defined in the porphyry, in which it is located, and shows remarkably rich croppings.

"Bill Williams' Fork has long been known for its extensive and rich copper deposits. The Creek of that name empties into the Colorado about 180 miles above Fort Yuma, and the mines are located twelve miles east of the river. The most important of these is the Planet, a mine that has been profitably worked for years. The vein lies very flat, and is often six and seven feet thick. It carries very rich copper ores, principally gray sulphuret, and all the different ores resulting from decomposition. Thompson's, and Knowles, Martin & Co's. properties, are other mines in the district, which have also been profitably worked for a long time, but lie idle at present. Ten miles below the mouth of Bill Williams' Fork, and three miles from the river, occurs an important group of veins in granite and metamorphous slates. The locality is called Empire Flat, and the peculiarity of the veins is, that besides the rich copper ores, the same as found at the upper mines, they contain layers of slightly copper-stained quartz, which is very rich in free, visible gold. The contents of several of the veins in gold go as high as $100 per ton. They are however not worked, being owned by poor men, who have not the capital at their command to erect beneficiating works. In this locality the chances offered to capital are exceedingly good, for the existence of good mines, plenty of wood and water, and cheap transportation, are all combined here. Besides, there is not the slightest danger from Indians.

"The veins of the La Paz district, east of the town of the same name, carry principally gold quartz. They lie either in talcose states or greenstone, and at least two of them, the Conquest and Constantia, show much free gold. Both have been worked to some extent, but no mill has been erected on either, though there is an abundance of quartz to supply mills continuously.

"Of the districts below La Paz the Eureka and Castle Dome are the most important. Both contain silver-bearing lead ores. The latter is interesting on account of the fluorspar, which is the sole gangue of the veins. The carbonates and galena ores being at the same time very solid, the product of this district has been much sought for by smelting works, and many tons of ore have been shipped, especially from the Castle Dome mine. The mines are eighteen miles from the Colorado, and only thirty miles above Fort Yuma, so that the ore can be laid down in San Francisco for $27 per ton. The price realized so far per ton of ore has been from $75 to $80. No smelting works have as yet been started on the spot, though the conditions for carrying on the smelting business are favorable. The principal mines, the Castle Dome and Polhamus', have lately come into the possession of Messrs. Hooper, Whiting & Co., and Captain Polhamus of Arizona City, and it is expected that this will hasten the speedy development of the district and the erection of lead works.

COLORADO RIVER MINES.

"The Colorado river mines are at this time especially inviting for the investment of capital. Not alone are all the ordinary conditions for successful mining favorable along the river, much more so than in many localities of the great silver State, Nevada, but there are also no difficulties whatever to be expected from Indians, an item which is in Arizona of the highest importance.

The above are the views in general of Mr. EILERS, formed while in Arizona, and I give them in the full belief that they are correct, and wholly devoid of intentional exaggeration or depreciation. W.

New Method of Generating Chlorine.

A MR. HENRY DEACON proposes to manufacture chlorine gas by a new process without the intervention of oxide of manganese. His method consists in passing a mixture of hydrochloric acid gas and atmospheric air—in such proportions that there will be in the latter sufficient oxygen to unite with all the hydrogen of the former—over a heated surface, which is not acted upon by any of the substances contained in the gaseous mixture. He employs pieces of red brick, previously dipping them in a solution of sulphate of copper and drying. These he places in tubes, heating to somewhat more than 800° Fah., and then passes the mixed gases through the tubes, when, if the details of the experiment have been carefully attended to, the oxygen of the air unites with the hydrogen of the hydrochloric acid, liberating the chlorine of the latter, which passes over with the inert and inactive nitrogen of the former. Thus far the process is not a commercial success, on account of some practical difficulties yet to be overcome, but the author is confident of ultimate success.

New Granada Mines.

BACK from the little port of Pinas, to the southward of the Bay of San Miguel, New Grenada, the site of the once celebrated Spanish Mines of Cana has been discovered. A London paper of 1702 gives an account of the capture of the mines by th sh buccaneers, who, with a force of seventy negroe

took out, "in the twenty-one days they were there, eighty pounds of gold, besides several pieces of plate which they found buried in the ground by the inhabitants," who had fled on the approach of the assailants, carrying with them most of their valuables. The recent discoverers came across traces of the former gardens, mill-houses and forts, besides finding four or five brass cannon, manufactured in Barcelona in 1641. Specimens of the ore found assayed $90 per ton.

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110,948, antedated December 31, 1870.—PADLOCK.—John H. Ames, Stamford, Conn.

110,949.—HARVESTER.—Thomas James Barnes, Corry, Pa.

110,950, antedated January 7, 1871.—RAILROAD-CAR VENTILATOR.—William C. Betts, Brooklyn, N. Y.

110,951.—BACK CENTER FOR MILLING-MACHINES.—Amos H. Brainard, Hyde Park, Mass.

110,952.—CLOTHES-DRIER.—Joseph L. Brigham, St. Paul, Minn.

110,953.—DEVICE FOR DISCHARGING OIL FROM TANKS.—William J. Brundred, Oil City, Pa.

110,954.—WOOD PAVEMENT.—William Bushnell, Elizabeth, N. J.

110,955.—BELT-GEARING.—James H. Butler, Hampden, Me.

110,956.—FILE-CUTTING MACHINE.—Pehr Johan Carlsson, Andover, Mass.

110,957.—GATE-LATCH.—Calvin Cole, Dayton, Ohio, assignor to Moses Glimor, same place.

110,958.—PAPER BED-BOTTOM.—James B. Crane, Dalton, Mass.

110,959.—PEN-CLEANER.—Samuel Darling, Providence, R. I.

110,960, antedated January 14, 1871.—BIT-BRACE.—William Pendleton Dolan, Charlottesville, Va.

110,961.—CLAMP.—John J. Dominic, Gallupville, N. Y.

110,962.—STAMP-CANCELLER.—Charles C. Egerton, Washington, D. C., assignor to Samuel E. Middleton and Daniel W. Middleton, Jr., same place.

110,963.—ELECTRO-MAGNETIC WEIGHING-MACHINE.—Henry Fairbanks, St. Johnsbury, Vt.

110,964.—COMPRESSION-COCK FOR FLEXIBLE TUBES.—Henry Fairbanks, Boston, Mass.

110,965.—AUTOMATIC WEIGHING AND DISTRIBUTING-SCALES.—Fairbanks, St. Johnsbury, Vt.

110,966.—SAW.—Walter Lafayette Gage, St. Louis, Mo.

110,967, antedated January 7, 1871.—PORTABLE CAMP-GRATE.—Lorenzo D. Gavitt, Los Angeles, Cal.

110,968.—CHURN.—Alden Gifford and Zenas A. Gifford, Somerset, N. Y.

110,969.—HARNESS SADDLE.—Algernon Gilliam, Pittsburg, Pa.

110,970.—MECHANISM FOR OPENING AND CLOSING TELEGRAPHIC STATION CIRCUITS.—Elisha Gray, Chicago, Ill.

110,971.—ENDLESS WIRE ROPE-WAY.—Andrew Smith Hallidie, San Francisco, Cal.

110,972.—MACHINE FOR MIXING AND BLEACHING SUGARS.—Melancthon Hanford, Lexington, Mass.

110,973.—ANIMAL TRAP.—George L. Hart, New Britain, Conn.

110,974.—WEDGE FOR SPLITTING WOOD.—Albert Heusser, Ellington, Conn.

110,975.—STAIR-ROD FASTENING.—Robert Hutchison, Newark, N. Y., assignor to William B. Gould, same place.

110,976, antedated January 7, 1871.—PUMP.—Edward T. Jenkins, Brooklyn, N. Y.

110,977.—ATTACHING DOOR-KNOBS TO THEIR SPINDLES.—James N. Karr, Buffalo, N. Y.

110,978.—FOUNTAIN PAINT-BRUSH.—Daniel J. Kellogg, Toledo, Ohio.

110,979, antedated January 5, 1871.—MANUFACTURE OF EYELET BLANKS.—William R. Landfear, Hartford, Conn.

110,980.—MODE OF FORMING BALLS OF TWINE AND CORD.—Hamilton B. Lawrence, Cropseyville, N. Y.

110,981.—MACHINE FOR MOLDING CHAIR BOTTOMS.—John Lemman, Cincinnati, Ohio.

110,982.—SIDING GAUGE.—William E. Lewis, Princeton, Iowa.

110,983.—MACHINE FOR MANUFACTURING HINGES.—William F. Lewis, Waterbury, Conn., assignor to Benedict and Burnham Manufacturing Company, same place.

110,984.—BURIAL-CASE.—Ivory Lorde, Moline, Ill.

110,985.—DOOR-CHECK.—Horatio Nelson Hicks Lugrin, Chelsea, Mass.

110,986.—CUTLERY.—Myran W. Lyman, Chicago, Ill.

110,987, antedated January 14, 1871.—SHOEMAKERS' TOOL.—Myron W. Lyman and Franklin C. Wyman, Chicago, Ill.

110,988, antedated January 9, 1871.—COTTON-SCRAPER AND HARROW.—John M. P. Lyon, Bellefonre, Ala.

111,989.—EARTH-CLOSET.—Patrick Malone, New Orleans, La., assignor to himself and Charles C. Landry, same place.

110,990, antedated January 8, 1871.—PRODUCING REFINED CAST-IRON, STEEL, AND MALLEABLE IRON.—John W. Middleton, Philadelphia, Pa.

110,991.—LUNCH-BOX.—David Miller, Allegheny City, Pa.

110,992.—ATTACHING KNOBS TO THEIR SPINDLES.—Charles Morrill, New York, N. Y., assignor to George H. Bidwell, same place.

110,993.—HOISTING APPARATUS.—Charles R. Otis and Norton P. Otis, Yonkers, N. Y.

110,994.—MATERIAL CALLED "OLE-IZERINE," FOR DYING AND PRINTING.—Alfred Paraf. New York, N. Y., assignor to Edward Sabine Renwick, trustee, same place.

110,995.—PROCESS OF EXTRACTING THE COLORING-MATTER OF MADDER.—Alfred Paraf, New York, N. Y., assignor to Edward Sabine Renwick, trustee, same place.

110,996.—TREE PROTECTOR.—Caroline Parks, Milan, Ohio.

110,997.—APPARATUS FOR DISTILLING AND CONCENTRATING LIQUIDS.—C. Chauncy Parsons, New York, N. Y.

110,998.—APPARATUS FOR EXTRACTING ESSENTIAL OILS.—George Gilman Percival, Waterville, Me., assignor to Isabel B. Percival, same place.

110,999.—OIL-PAINT FOR COATING OIL-CLOTH.—Thomas Potter, Philadelphia, Pa.

111,000, antedated January 5, 1871.—MACHINE FOR MIXING CONCRETE, &c.—Silas Putnam and Thomas Burt, Rockville, Conn.

111,001, antedated January 7, 1871.—FILTER.—Louis Raecke, New York, N. Y.

111,002.—LET-OFF MECHANISM FOR LOOMS.—Horatio A. Remington, Anthony, R. I.

110,003.—BURGLAR-ALARM.—William Reynolds, Manchester, N. H.

111,004.—MACHINE FOR BURRING WOOL, &c.—William Richardson, Oldham, Great Britain.

111,005.—LOCK FOR DOORS, &c.—Benjamin F. Roberts, Lacona, Iowa.

111,006.—JOINT FOR RAILWAY-RAILS.—William W. Robinson, Ripon, Wis.

111,007.—OPEN LINK FOR COUPLING DOUBLE AND WHIFFLE-TREES.—Newton C. Sample, Penningtonville, Pa.

111,008.—CASE FOR ODOMETERS.—Jacob D. Seipel and Cyrus B. Alsover, Easton, Pa.

111,009.—FRUIT-PICKER.—Walter L. Shaw, Etna, Pa.

111,010.—IRON VIADUCT.—C. Shaler Smith, Baltimore, Md., assignor to the Baltimore Bridge Company, same place.

111,011.—CLOTHES-DRIER.—Horace Swan, Woodstock, Vt.

111,012.—CUSTARD AND CAKE-BAKER.—Charles L. Sweatt and George A. Huntoon, Fishersville, N. H.

111,013.—MACHINE FOR MAKING SPIKES.—James H. Swett, Pittsburg, Pa.

111,014.—MACHINE FOR SPLITTING, BEVELING, AND BENDING METAL TUBE-SKELPS.—Stephen P. M. Tasker, Philadelphia, Pa.

111,015.—MACHINE FOR SLITTING, BEVELING, AND BENDING METAL TUBE-SKELPS.—Stephen P. M. Tasker, Philadelphia, Pa.

111,016.—MACHINE FOR SLITTING AND BENDING METAL TUBE-SKELPS.—Stephen P. M. Tasker, Philadelphia, Pa.

111,017.—MACHINE FOR BENDING METAL TUBE-SKELPS.—Stephen P. M. Tasker, Philadelphia, Pa.

111,018.—FAUCET FOR BEER OR OTHER BARRELS.—Samuel Thompson, Schaghticoke, N. Y.

111,019.—WATER-WHEEL.—Jacob W. Truax, Essex Junction, Vt.

111,020.—WINDOW FOR STOVES.—Henry B. Van Benthuysen, Lock Haven, Pa.

111,021.—WAGON-BOX AND WAGON-RACK LIFTER.—Izaak Van Kersen, Kalamazoo, Mich.

111,022.—SHANK-PIECE FOR BOOTS AND SHOES.—Jeremiah M. Watson, Sharon, Mass.

111,023.—COTTON-CROPPER.—Dwight F. Welsh, Nevada, Ohio.

111,024.—PRUNING-HATCHET.—Jerison White, Providence, Pa.

111,025—ROCK-DRILL.—George L. Williams, of Mine La Motte, Missouri, assignor to himself, Radcliffe B. Lockwood, and William A. Scott, same place.

111,026.—ROTARY PUMP.—Irvin Williams, Baldwinsville, N. Y.

111,027.—HOT-AIR FURNACE.—Charles Allen, Hartford, Conn.

111,028.—REVERSIBLE KNOB-LATCH.—William H. Andrews, New Haven, Conn., assignor to Burton Mallory, same place.

111,029.—SHINGLE-MACHINE.—Holiday C. Babcock, Eureka, California.

111,030.—HYDRO-ATMOSPHERIC ELEVATOR.—Cyrus W. Baldwin, Boston, Mass.

111,031.—FIRE-BAR.—William Batchelor, Winchester, England, assignor to Edwin Russ and Thomas Shewell Morris, same place.

111,032.—WATER OR STEAM-VALVE.—Robert Berryman, Hartford, Conn., assignor to the Berryman Regulator and Alarm Company, same place.

111,033.—PLOW.—Hiram R. Bowen and Lorenzo D. Robnett, New Washington, Ind.

111,034.—COTTON-SEED HULLER.—Horace C. Bradford, Providence, R. I., assignor to himself and N. H. Fenner, same place.

111,035.—FEED-CUTTER.—Joseph H. Bradley, Hillsborough, Ohio, assignor to himself and Charles S. Bell, same place.

111,036.—STEAM BOILER.—Adolph Brase and Lemuel Salladay, Sciotoville, Ohio.

111,037.—CULTIVATOR.—George Walter Bronson, Ottawa, Ill.

111,038.—STAMP-CANCELER.—Franklin W. Brooks, New York, N. Y.

111,039.—BOOTS AND SHOES.—Franklin J. Burcham, Racine, Wis.

111,040.—FLUID METER.—Leopold F. Buschmann, New York, N. Y.

111,041.—HAY-TEDDER.—William H. Butterworth, Trenton, N. J.

111,042.—THRASHING-MACHINE.—Henry Russell Canine, Waveland, Ind.

111,043.—HAY AND COTTON-PRESS.—Nathan Chapman, Hopedale, Mass.

111,044.—MEDICAL COMPOUND PILLS FOR CURE OF COLDS, &c.—William E. Chilson, Troy, Pa.

111,045.—PRESERVING WOOD.—Benjamin H. Detwiler and Samuel G. Van Gilder, Williamsport, Pa.

111,046.—HOUND, SWAY-BAR, TONGUE-BRACE, AND CROSS-BAR OF VEHICLES.—Gerard Doan, Theodore Wallis, and George D. Morland, Fleming, N. Y., assignors to Thomas M. Jones, Chicago, Ill.

111,047.—GRATE BAR.—Albert Fickett and Charles C. Benton, Rochester, N. Y.

111,048.—MACHINE FOR LINING STRAW BOARD, &c.—Benjamin F. Field, Beloit, Wis.

111,049.—SHIRT-BUTTON OR STUD.—Levi W. Fifield, Worcester, Mass., assignor to Thomas F. Arnold and Henry E. Webster, Providence, R. I.

111,050.—SEED-DRILL AND COCKLE SEPARATOR COMBINED.—John E. Fletcher, Rectortown, Va.

111,051.—PAPERING PINS.—George Fowler, Seymour, Conn.

111,052.—LIGHTNING-ROD.—Joseph R. Fricke, Pittsburg, Pa.

111,053.—PORTABLE CHAIR.—George Gardner, Glen Gardner Station, Clarkesville Post-Office, N. J.

111,054.—FIRE-TONGS.—Alfred M. George, Sand Fly, Texas.

111,055.—PLOW.—Elias Hayman, Columbus, Ga., assignor to Blount, Haiman & Brother.

111,056.—PLOW.—Thomas Harding, La Fayette, Ind.

111,057.—EMERY WHEEL.—Thomas Harding, La Fayette, Ind.

111,058.—CONSTRUCTION OF BARRELS FOR BEER, &c.—Matthew Hawe, Albany, N. Y.

111,059.—SEWING-MACHINE.—Arthur Helwig, London, England, assignor to himself and Simon Collins, same place.

111,060.—WATER-METER.—Frederick G. Hesse, Oakland, Cal.

REISSUES.

4,232.—HORSE HAY-RAKE.—Newcomb M. Barnes, Tiffin, Ohio.—Patent No. 105,542 dated July 19, 1870.

4,233.—TREADLE FOR SEWING-MACHINES.—John A. Bradshaw, William H. Brown, and Darius Whithed, Lowell, Mass.—Patent No. 92,786, dated July 20, 1869.

4,234.—CURTAIN OR SHADE-FIXTURE.—William Campbell, New York, N. Y., assignor to Nathan Campbell.—Patent No. 44,602, dated October 14, 1864.

4,235.—MACHINE FOR FORMING THE BRIMS OF FELT HATS.—William A. Fenn, Rochester, N. Y.—Patent No. 17,023, dated April 14, 1857.

4,236.—APPARATUS FOR SUSPENDING GASOLIERS AND DROP-LIGHTS.—Samuel B. H. Vance, New York, N. Y., assignor to Mitchell, Vance & Co., same place.—Patent No. 70,685, dated November 5, 1867.

DESIGNS.

4,567.—DRESS-TRIMMING.—John Cash and Joseph Cash, Coventry, England.

4,568.—DRESS-TRIMMING.—John Cash and Joseph Cash, Coventry, England.

4,569.—DRESS-TRIMMING.—John Cash and Joseph Cash, Coventry, England.

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4,580.—DRESS-TRIMMING.—John Cash and Joseph Cash, Coventry, England.

4,581.—DRESS-TRIMMING.—John Cash and Joseph Cash, Coventry, England.

4,582.—DRESS-TRIMMING.—John Cash and Joseph Cash, Coventry, England.

4,583.—DRESS-TRIMMING.—John Cash and Joseph Cash, Coventry, England.

4,584.—DRESS-TRIMMING.—John Cash and Joseph Cash, Coventry, England.

4,585.—PUMP.—Leonard Egleston, Seneca Falls, N. Y., assignor to Rumsey & Co., same place.

4,586.—SHOW-CASE.—José Ramon Gallegos, Havana, Cuba.

4,587.—STEM OF A TOBACCO-PIPE.—John Watts, Philadelphia, Pa., assignor to Harvey & Ford, same place.

TRADE-MARKS.

135.—COSMETICS, POMADES, AND PERFUMERIES.—Holbrook & Merrill, Boston, Mass.

136.—WORSTED GOODS.—Samuel McLean, New York, N. Y.

137.—GIN.—I. D. Richards & Sons, Boston, Mass.

138.—ILLUMINATING OIL.—Jacob D. Spang, Dayton, Ohio.

139.—KEROSENE AND SPIRITS OF TURPENTINE.—Francis Spies, New York, N. Y.

140.—BOOTS AND SHOES.—Elmer Townsend, Boston, Mass.

141.—AKRON CEMENT.—"The Union Akron Cement Company," Buffalo, N. Y.

142.—WHISKY.—H. Webster & Co., San Francisco, Cal.

EXTENSIONS.

THOMAS NELSON, of Troy, N. Y.—Letters Patent No. 16,248, dated December 10, 1856.

JOSEPH H. GOODELL, of Logansport, Ind.—Letters Patent No. 16,306, dated December 23, 1856.

SAMUEL G. LEWIS, of Philadelphia, Pa., executor of LEA PUSEY, deceased.—Letters Patent No. 16,286, dated October 23, 1856.

JOHN J. SQUIRE, of De Soto, Mo.—Letters Patent No. 16,318, dated December 16, 1856; reissue No. 3,303, dated February 16, 1869.

BENJAMIN G. DAWLEY, of North Providence, R. I.—Letters Patent No. 16,306, dated December 23, 1856.

HENRY EDDY, of North Bridgewater, Mass.—Letters Patent No. 16,267, dated January 6, 1857; reissue No. 1,300, dated April 8, 1862.

Report of the Geologist of the General Land Office.

DEPARTMENT OF THE INTERIOR,
GEOLOGICAL ROOMS OF THE GENERAL LAND OFFICE,
WASHINGTON, D. C., Jan. 12, 1871.

Hon. JAS. S. WILSON, Commissioner of the General Land Office, Washington, D. C.

SIR—In accordance with your instructions, I have the honor herewith to submit the following, showing what has been accomplished since the organization of the geological and mineralogical cabinet connected with your office, viz.:

By order of the honorable Secretary of the Interior, and under your direction, a cabinet of practical geology and mining has been opened, on the 20th of March, 1868, and I had the honor to be assigned to duty by you as curator of this cabinet. Charged with its organization, the objective purpose in view was an urgent necessity for a more general diffusion of information relating to the economical capabilities of the public lands for agricultural and mining purposes—more particularly to undeceive the public mind in regard to the rumored infertility of certain districts; to facilitate the disposal of the public lands by collecting the best attainable information concerning the soil, minerals, ores, and other industrial resources; to make an effort to arrest the gross abuses arising from a wasteful method of mining, which had been adopted by the reckless and inconsiderate; to stimulate the production of the precious metals, by developing new localities for mining, and thereby relieve the national finances while laboring under a heavy indebtedness; to establish within the Land Office at Washington a point of common intercourse for all who are interested in the mineral and agricultural resources of the national territory, and to place there on exhibition specimens from every part of the Union, classified by States, and showing every mineral product obtainable therein, with the exact locality; finally, to accomplish all this without increasing in any degree the expenditures of the office.

Impressed with these views, applications were made to the Governors of the States and Territories, as well as to scientific institutions, soliciting contributions, and to the Surveyor Generals, Registers and Receivers, respectively. A circular was issued, dated May 4, 1868, making it their official duty to secure and transmit to the General Land Office specimens illustrative of the natural history of that part of the public domain lying within their jurisdiction, a copy of which is hereto appended.

The undertaking has been crowned by a success which may well be regarded as astonishing, for within the short period of time which has elapsed a great museum of natural objects from every State and Territory has been brought together; the articles have been scientifically determined, arranged in the order of their natural affinities, and labeled so plainly that any one possessed of even humble abilities can obtain the information for which he is seeking.

A large apartment having been assigned for the purpose, it was fitted up with suitable alcoves or cases for the reception of objects contributed to the museum from each State and Territory—the minerals, ores, fossils and other resources connected with them, which it is designed to illustrate. The appreciation of the work has been so marked by the public that the apartment is commonly thronged by visitors, and is especially resorted to by such persons as are interested in mining, by the manufacturers of chemical products, and by the student of pure science. That the cabinet has been the means of making known to the country some of the most important mineral discoveries of the time will be fully evident from the following statements, which recite in a brief way a few only of the novelties proclaimed from this office:

TEXAS COPPER GLANCE.

A deposit of unexampled extent, of which information was first communicated to this office by a citizen of Texas, has been discovered in Archer, Wichita and Haskell counties, on Big and Little Wichita rivers. Mr. M. D. BULLIAN having seen a newspaper notice of our cabinet, forwarded a sample of this valuable ore to the office, with the remark that "if the stuff is of any account at all, I can load up five hundred wagons with it from my place *without digging*." He encountered the mines

when hunting cattle near the Wichita, in pursuance of his business of stock-raising.

Upon examination it was found to be a highly interesting ore of copper, nearly a pure sulphuret, containing about fifty-five per cent. of metal. Its geological connections are of the highest interest, and prove that this metalliferous tract is a portion of the Permian formation, which stretches down from Kansas into Texas, and is the only example of this formation in the United States. The ore is found lying on the hill-sides, and always on the surface, giving no trouble in mining or for drainage. Three persons in ten hours dug out 6,000 pounds of the ore, averaging nearly sixty per cent. Coal, timber, limestone, soapstone, and all other requisites for building furnaces and smelting the ore are in the immediate vicinity. The projected line of the Memphis, El Passo and Pacific Railroad passes over the locality. At present, however, mining operations can be conducted only at the hazard of life from bands of prowling savages.

TIN ORES FROM MISSOURI AND CALIFORNIA.

The high economical value of the metal tin to this country has placed every one prospecting for metals on the *qui vive* for the detection of this ore. Several places have been long known as furnishing it in minute quantities—none, however, promising important results until a tin oxide was discovered in Madison county, Missouri. It occurs in a syenite or diorite rock, of which there are extensive beds, and the lode at one place has been traced to a porphyry rock. A great effort has been made to engage the attention of capitalists in the work of exploration, but thus far little has been accomplished. An analysis having been made of the ore, yielded only 0.39 to 0.45 per cent. of metal. This result being promptly published by the office, served to check speculation, and prevented loss in the enterprise. The part of Missouri containing this formation is wild and mountainous, unsettled and unexplored, and it is reasonable to suppose that further search may develope more important results.

At an exposition of agricultural, manufacturing and mineral resources of California held in San Francisco in 1869, unmistakable evidences of the existence of tin in California were furnished, corroborating the expectation raised upon some pieces of *wood tin-ore,* some time before received at our cabinet. The exhibition was a surprising one to all, and consisted of sacks of the ores, bars of the metal, heavy tin plate, and various domestic utensils made from it. This tin ore is derived from a mining property of 50,000 acres of mineral land, upon which twenty-three openings were yielding the ore at last accounts. It is situated near San Jacinto, Bernardino county, California. An analysis by Dr. GENTH, shows 13.37 per cent. of metal, and the metal 99.78 fine. Two shafts have been opened of 90 and 100 feet respectively, and a tunnel of 45[illegible] feet will cross-cut the vein in various directions. The importance of this discovery cannot be too highly estimated, since the metal is found in but few places and some of them exceedingly remote from the United States.

HORN SILVER IN NEVADA.

Among the new localities of the precious metals first reported to this office, was that of horn silver, or the chloride of silver, which is distinguished for its soft wax-like consistence, and hitherto as being very sparsely distributed in foreign mines. It was the Hidden Treasure mine of the White Pine District, which yielded it in such surprising sheets and masses, as to require the invention of new methods for working it in quantity. It was first introduced to our cabinet as a thick plating on one side of a mass of silver glance, and since then it has occurred in such abundance at the mine, as to be stripped off the walls of the vein in sheets, and from its softness unfit to be placed under the stamps like ordinary ores. The vein-stone is quartz, and the rest of the ore is sulphuret of silver, associated with antimonial silver. The yield is stated to range from $250 to $14,000 per ton. The mine is at an elevation of 8,200 feet above the level of the ocean, in the White Pine Mountains and created an excitement in the mining community equal to that of the celebrated Comstock lode.

The Aurora, Eberhardt and Keystone mines belong to the same range, the latter mine being remarkable for the large quantity of red oxide or ruby silver ore obtained from it. The vein is 100 feet wide, and has been exposed for about 200 feet. In every part the chloride predominates in richness and exceeds in value any argentiferous deposit previously discovered. Two hundred tons of it having been worked up averaged $1,350 per ton. About twenty tons were selected as being too rich in chloride to be put through the mill, which, according to assay, were worth $10,000 per ton. These mines have added millions to the volume of metallic currency in the United States.

Another remarkable deposit of silver which has but recently been brought very prominently before the public—that of Silver Island on the north shore of Lake Superior—was first brought to the knowledge of this office by Mr. WM. B. TRUE. The native metal is disseminated through quartz in grains and filaments or strings, whilst the side vein is loaded with silver glance and other mineralized forms of sulphuret of silver. An analysis discloses also the presence of cobalt and nickel in this mine.

ALKALINE SALT DEPOSITS.

Through the efforts of the Surveyor General of Nevada and his assistants, there was first communicated to this office and to the world a knowledge of this vast deposit of salts of soda and potash in Churchill county, Nevada. They contain carbonates and muriates of soda, with sulphate and muriate of potash associated with small quantities of iodides and bromides. The locality is on an island in Soda Lake, near Pagtown, 1½ miles south of the emigrant road to Humboldt. Pure potash and soda can now be manufactured in any quantity, and the immense quantities consumed in the arts of civilized life need no longer suffer any restriction. The deposit is perfectly analogous chemically with the celebrated Stassfurth bed in Prussia; but whilst that is reached by a shaft of over 100 feet, the Nevada article is on the surface. From the residual liquor after the extraction of the crystalline salts, the important substance, bromine, may be elaborated in quantities great enough to supply the United States. Its recent employment in preparing the brilliant aniline dye-colors has greatly increased the demand for that article, and having once been prepared by the owner, it is now manufactured by the hundred weight.

ANTHRACITE COAL IN TEXAS.

For a long time supposed to be the sole product of Pennsylvania mines, we have received information of the existence of a five-feet bed of this coal in Young county, Texas. The conversion of bituminous coal into this hard variety is known to be due to the injection of quartz trap and porphyry rocks contemporaneously with the filling of the copper veins last referred to, which are also in the same geological connection. The locality is near Fort Belknap, and is part of the regular carboniferous formation which covers 6,000 square miles in Texas with an average thickness of 300 feet. Anthracite was also found in New Mexico, Santa Fé county, where large beds are now worked. They are believed to be of tertiary age, and that they have been converted into hard coal by the superincumbence of beds of melted porphyry, forty or fifty feet in thickness, which expelled its volatile ingredients. The mines are from twenty-seven to seventy-five miles south of Santa Fé, in veins of four to seven feet in thickness.

From the State of Texas also is reported to us extensive deposits of iron ore, in Llano, Burnet and Mason counties. An analysis of it shows 96.89 of the mixed oxides, proving it to be a magnetic oxide, and which will yield 74.93 per cent. metallic iron to the 100 pounds of ore. They are the same in composition and in geological position as the celebrated Swedish mines and the Iron Mountain of Missouri, and surrounded by granite and primary rocks.

Accompanying these ores was a specimen of the magnificent red sienite similar to that of the famed Egyptian obelisks, and also that exported so largely from Peterhead in Scotland.

COAL FROM ALASKA.

Another coal brought into prominent notice by this office is a dense, bituminous form of tertiary coal, of which samples were received from the Treasury Department of the United States, they having been brought home in the U. S. revenue steamer "Wyanda," and collected by her surgeon, Dr. J. T. MINOR. The locality is about sixty miles from Sitka, in Cooke's Inlet, where the beds are from 18 inches to 6 feet thick, being from 30 to 60 feet below the top of the bank, with a slight dip to the north-east. It has been found excellent for generating steam on board the "Wyanda."

Having been analysed by Dr. GENTH it was found to contain: Water, 15.7; volatile matter, 35.1; carbon, 45.7; ash, 3.3. From its solution in nitric acid a coniferous resin is precipitated. The ash is brownish yellow and has an alkaline reaction. It belongs to the class of brown or Bovey coal, a sort which is well known in England and in Germany. Its calorific power in reducing metals may be inferred when compared with charcoal, the numbers being respectively 20.15 to 34.

The results of a scientific investigation of the fossils and minerals in our cabinet have frequently enriched the pages of scientific journals and the proceedings of learned societies. Professors LEIDY and MEEK have published descriptions of new fossils, as of the fossil tortoise from Wyoming, corralines, a crinoid (Barycrinus), fishes, ammonites, and scaphites; and Dr. GENTH has detected new mineral species among such as have been forwarded to him for examination. Of the latter none are more remarkable than the Tellurium compounds obtained from the Uncle Sam (auriferous) lode, near Helena, in Montana Territory. Specimens were first sent to the office by Messrs. CALDWELL, HAMILTON & Co., bankers at Omaha, Neb., and were recoguized here as ores of tellurium. One of them—the gray compound called tetradymite is a sulphide and telluride of bismuth—had been previously found in Hungary, also in North Carolina. A variety of it from Highland mountain was described by Dr. GENTH as telluride of bismuth, previously found at Field mine in Georgia, and Fluvanna county, Virginia. He also described a new mineral as montanite, which is a hydrated tellurate and oxide of bismuth resulting from the oxidation of tetradymite. These ores have a matrix of quartz and are very rich in gold.

In addition, it may be stated that from correspondence connected with the cabinet, this office has been the first to acquire a knowledge, and to communicate to the public information concerning nearly all the useful metallic, alkaline and earthy substances used in the commercial intercourse of nations or in domestic manufactures. Among these should be enumerated new localities of gold and silver lodes without number, as well as the more common metals, as iron, copper, lead, zinc, nickel, bismuth, tin, and of cinnabar one locality in Oregon. Constant applications for information upon the subject of new and old localities where may be found the following substances, have been promptly replied to or communicated through the press, to wit: Alabaster, alum, anthracite, borax, Cannel coal, chrome ore, clay for pottery-ware, infusorial earth, coal oil, asphaltum, petroleum, hydraulic limestone, gypsum, lithographic stone, nitre, marbles, mineral waters, potash, soda, salts, phosphate of lime, manganese, roofing-slate, soapstone, sand for glass-works, and moulding sand.

There have appeared in the newspapers, almost daily, communications prepared in this office relating to these new discoveries, and contributing interesting information concerning the geological or mineral character of specimens received, with extended notices of their composition, process of extraction, and uses when applied to arts or manufactures.

Respectfully submitted. A. R. ROESSLER.

BUSINESS AND PERSONAL.

[*Short notices in this column fifty cents per line each insertion.*]

GLYNN'S ANTI-INCRUSTATOR FOR STEAM BOILERS.—THE only and reliable article for removing and preventing incrustation. No foaming, and does not attack metals of boiler. Liberal terms to agents. C. D. FREDRICKS, 587 Broadway, N. Y.
April 19 tf

IMPORTANT TO INVENTORS.

WESTERN AND CO.'S PATENT AGENCY.

CHARLES ROGERS, Solicitor and Manager.

In connection with the publication of the ENGINEERING and MINING JOURNAL and the MANUFACTURER AND BUILDER, we have frequently received applications from subscribers and patrons to act as their agents in transacting business with the United States Patent Office; and in view of the increasing number and urgency of such requests, we have resolved to add this department to our business. We have accordingly organized

A COMPLETE PATENT AGENCY,

and now offer our services in procuring patents in this and foreign countries, and transacting all business relating to the obtaining of patents.

Being possessed of superior facilities, in connection with our associate attorneys in Washington and foreign countries, for the successful prosecution of this business, we do not hesitate to guarantee satisfaction to all who may entrust their business to our care.

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CONTENTS:

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REPORT:
PART I.—Observations of the present condition of the mining industry:
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Chapter I.—The new Almaden mines.
II.—The Mother Lode of California.
III.—The quartz and placer mines of Nevada County.
IV.—Giant powder and common pewder.
SECTION II.—*Notes on Nevada:*
Chapter V.—Present condition and prospects of the Comstock mines.
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XIV.—Placer mines.
YV.—Quartz mines.
XVI.—Operations of the United States law.
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SECTION VII.—*Mining Education—Continued.*
Chapter XXXIV.—The Freiberg School of Mines.
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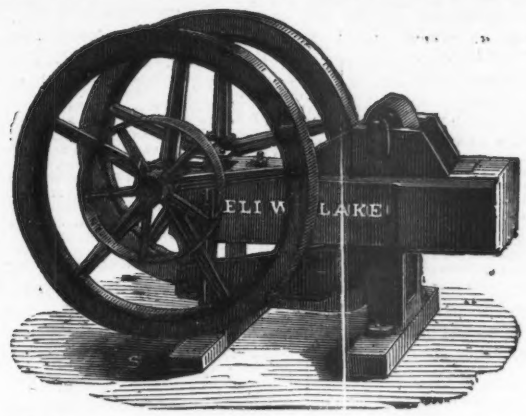

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Frederick Franck being duly sworn, says that he is Secretary of the Company named in the above report, and that the facts stated in said report are true to the best of his knowledge and belief.

FRED. FRANCK.

Sworn to before me this 19th day of January 1871.
JOHN F. ROBERTS.
Notary Public in and for the city and Co. of New York.

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47	Iron Jack-plane, Bailey's patent	7 50	15	47
48	Iron Fore-Plane, Bailey's patent	9 00	17	55
49	Iron Jointer-Plane, Bailey's patent	10 00	18	58
50	Wood Smoothing-Plane, Bailey's patent	3 00	8	30
51	Wood Fore-plane, Bailey's patent	4 50	10	35
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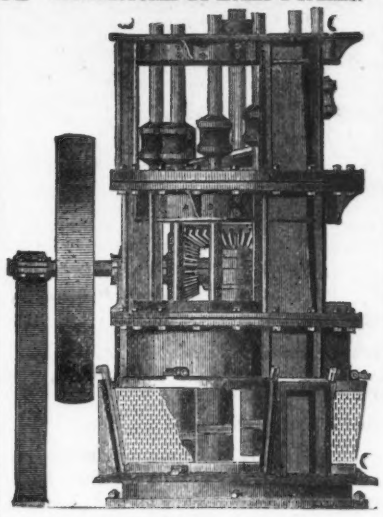

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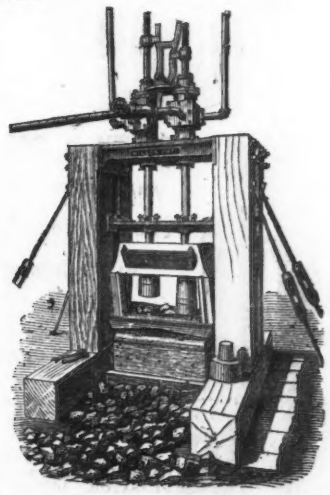

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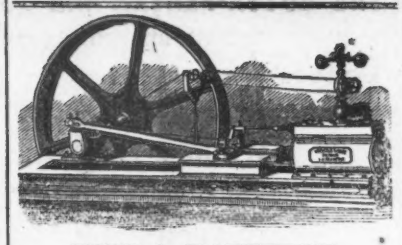

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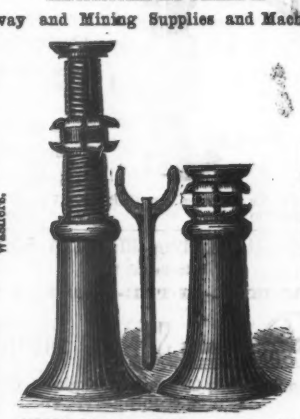

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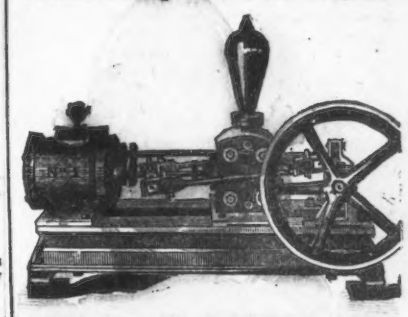

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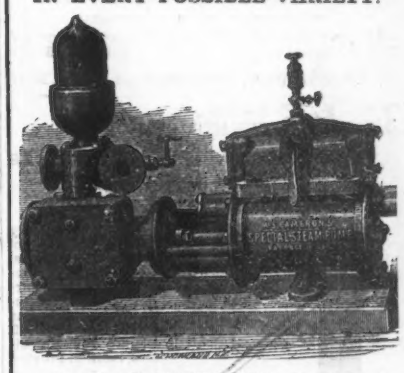

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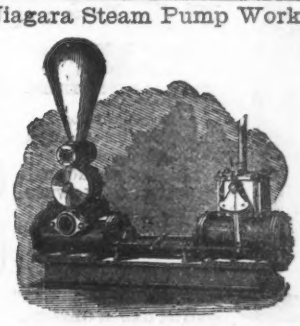

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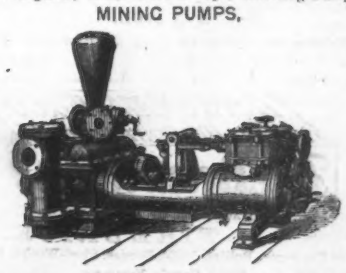

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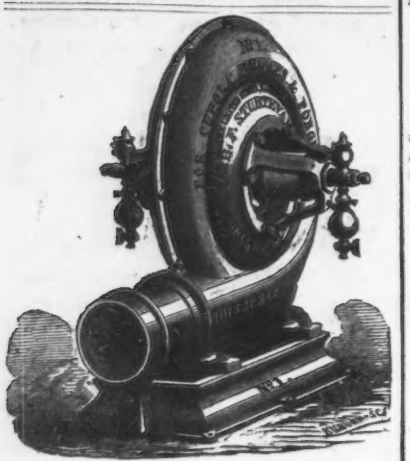

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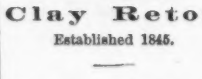

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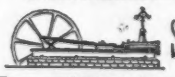

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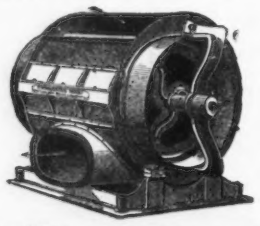

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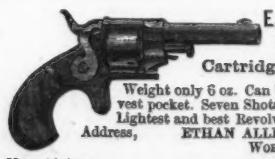

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